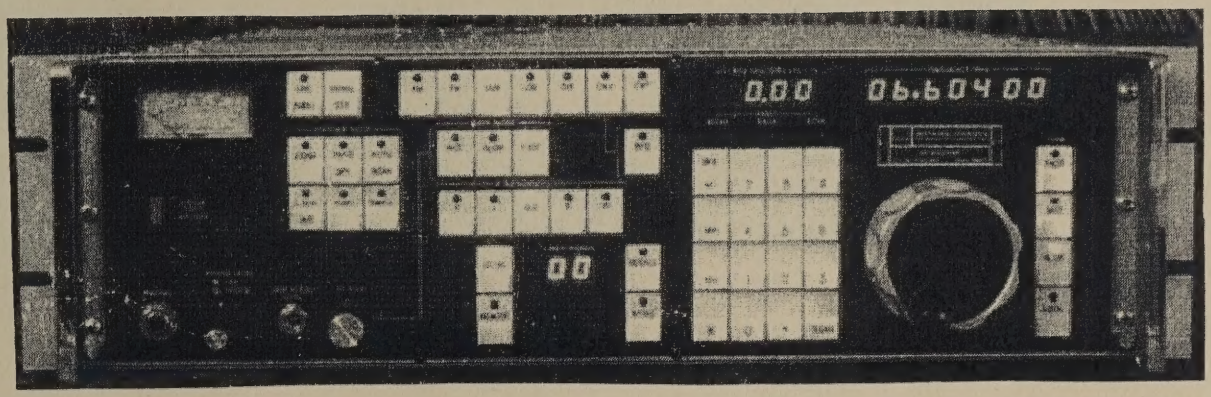
Tech-notes



WJ-8716 and WJ-8718

WATKINS-JOHNSON

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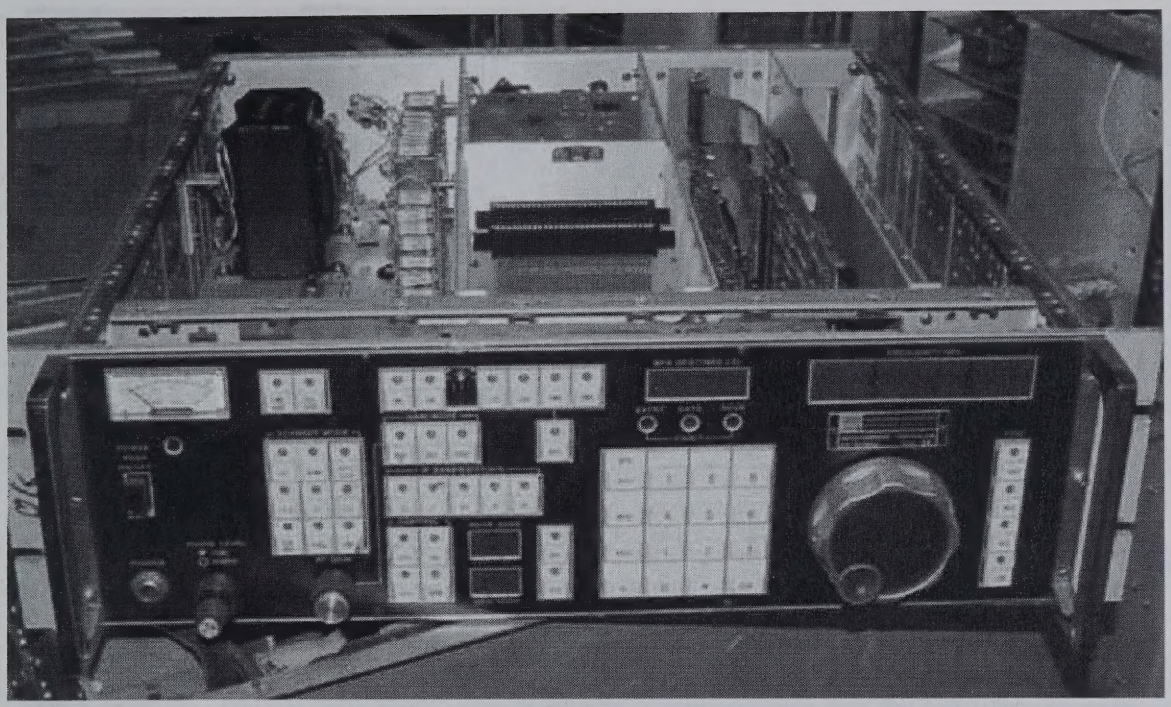

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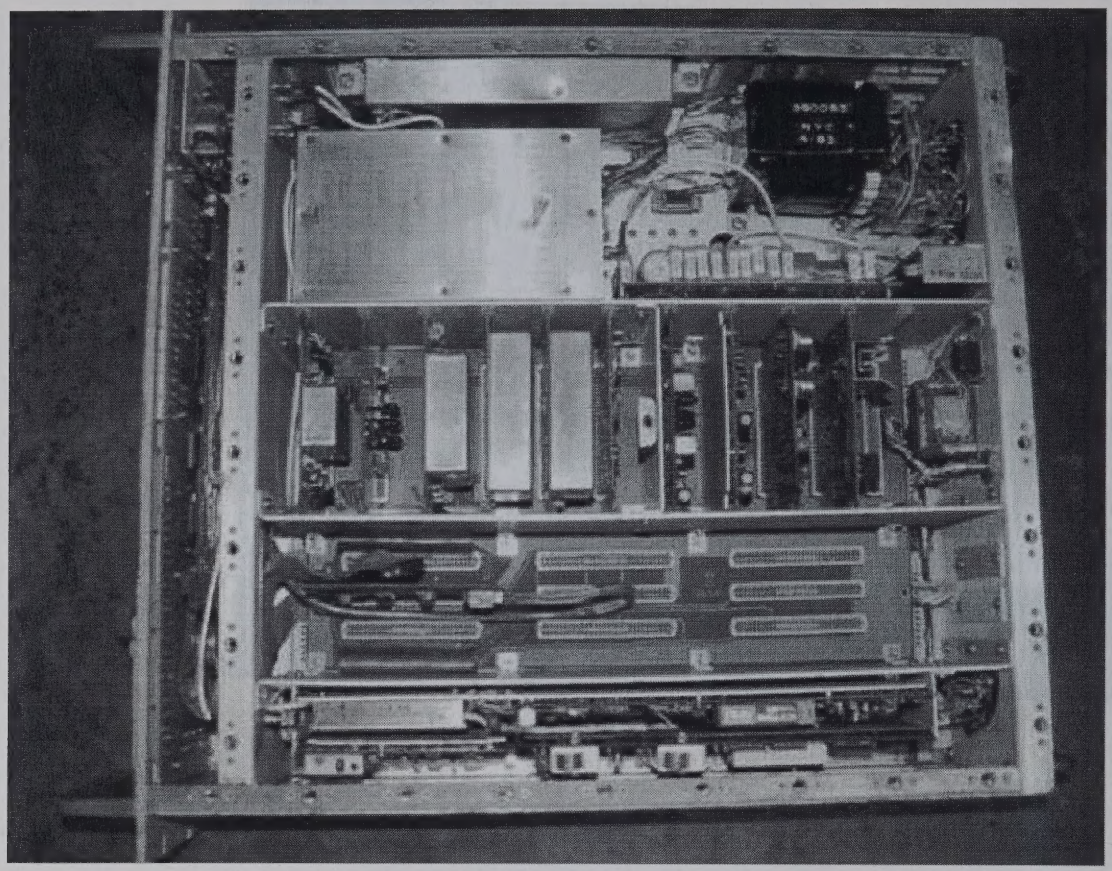

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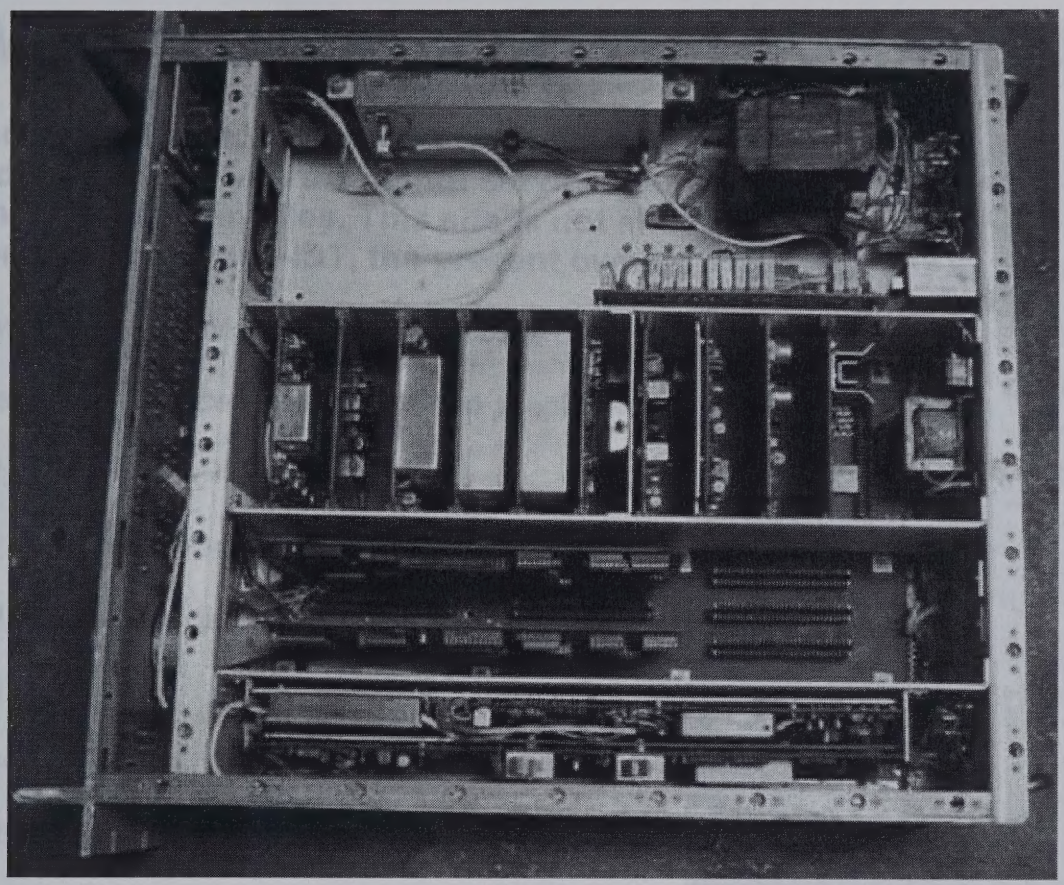

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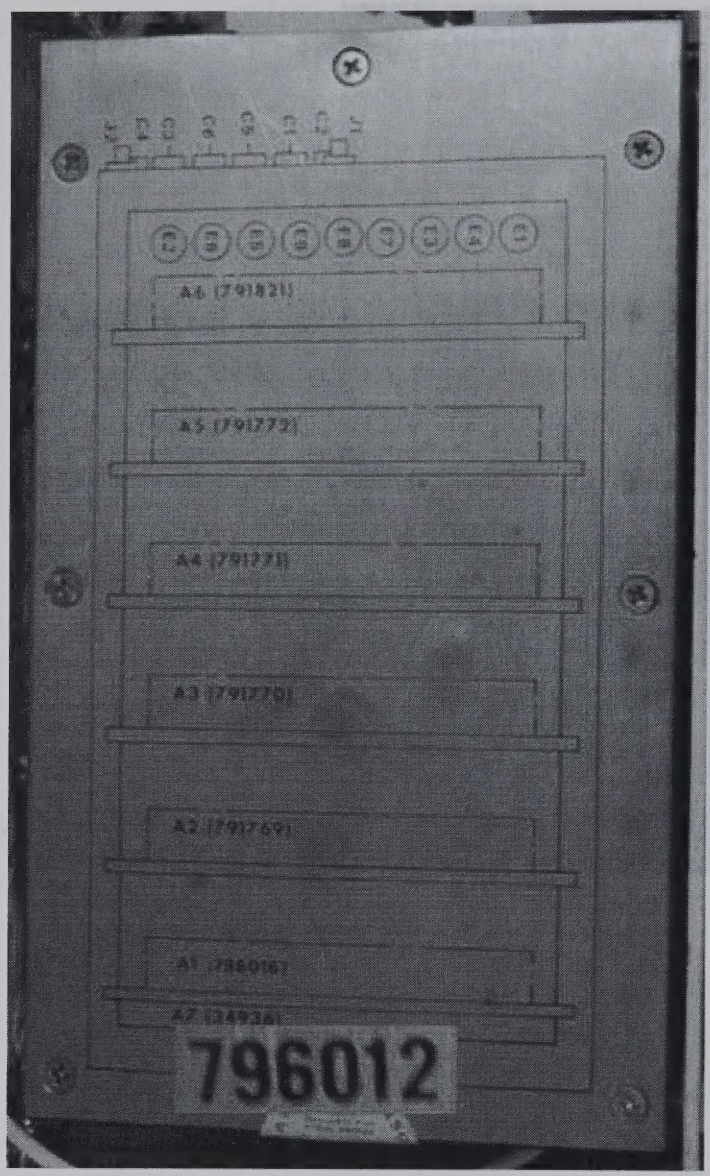


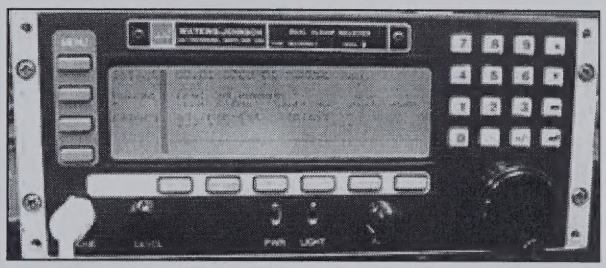
Communications Electronics Inc. and Watkins Johnson Radio Information Site

I created this page because I have collected some hard to find information about these radios over the years. I do not service them or sell documentation. I just want to share what I have in my files. This site is not affliated in any way with the Watkins Johnson company or Signia-IDT, the present owners of WJ. It is a hobby site for fellow hobbyists.

It will take a long time to flesh this website out. Please check back periodically.

Resources - sources for manuals and people who repair radios

WJ receivers



WJ surveillance receiver systems

SDU - spectrum display units

CEI receivers

Accessories and components basic information guide

Historical connections - Nems-Clarke, Regco and LTV

If you have information you'd like to share, I'd be happy to consider adding it to this site. Contact me at watkins-johnson@terryo.org

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WJ Receivers

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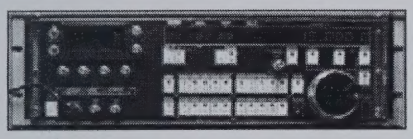
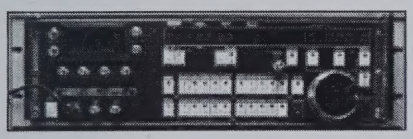
Receivers and tuners basic information guide for CEI and WJ

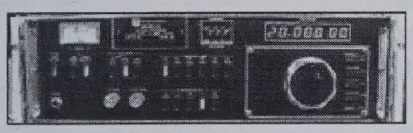
WJ-8615 series



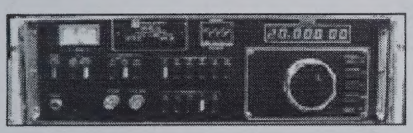
WJ-8617 series



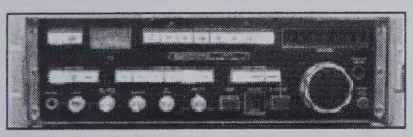
WJ-8618 series



WJ-8716 series



WJ-8718 series



WJ-8888 series

more to follow

INSTRUCTION SUPPLEMENT

FOR

WJ-8716 HF RECEIVER

INTRODUCTION

The WJ-8716 HF Receiver is a modified version of the WJ-8718 HF Receiver. An outline of the electrical and mechanical differences as well as supplemental parts list and schematic diagrams are included in this supplement. This manual supersedes previous supplements of the WJ-8716. All other technical information in the WJ-8718 HF Receiver Instruction Manual also pertains to the WJ-8716 HF Receiver.

WATKINS—JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20878

Revision I 8/79

June 18, 1985
ADDENDUM I

PURPOSE OF ADDENDUM

The information in this addendum is provided to correct and update the WJ-8718 Series HF Receiver Instruction Manual.

Specifically, this addendum replaces a previously issued Field Bulletin, dated February 8, 1985, concerning spare parts for the WJ-871X VCO Assembly 791629. The field bulletin delineated four possible replacement parts for IC U1 (divide-by-4) on the 1st LO VCO P.W.A., depending on the board revision level and on-hand availability of the replacement part.

This addendum describes a direct replacement part for U1, Part No. SP8610A. This 14-pin chip directly fits the 1st LO VCO P.W.A., regardless of its board revision level and without the need of a transition board. This information should be incorporated in the parts list of the WJ-8718 Series HF Receiver Instruction Manual as indicated below.

1.1 Paragraph 5.6.5.1.1.1, page 5-63, Part 34750 parts list should be corrected as follows:

1. **From:** U1, Integrated Circuit, Qty 1, Part No. MC197L, Mfr. Code 04713

   To: U1, Integrated Circuit, Qty 1, Part No. SP8610A, Mfr. Code 52648

June 18, 1985
ADDENDUM II

The information in this addendum is provided to correct and update the WJ-8718 Series HF Receiver Instruction Manual.

1.1 Paragraph 5.6.8, Type 791578-1 Frequency Display parts list, page 5-90, should be corrected as follows:

From: U8, Integrated Circuit, Qty 1, Part No. DS8857N, Mfr. Code 27014

To: U8, Integrated Circuit, Qty 1, Part No. MM74C48N, Mfr. Code 27014

1.2 Revise Type 791578-1 Frequency Display (A8) schematic diagram, page 6-49, as shown.

From:

To:

REVISION
WJ-8718 SERIES HF RECEIVER

TITLE:	INSTRUCTION MANUAL FOR WJ-8718 SERIES RECEIVER
INSTRUCTION MANUAL DATE:	OCTOBER 1983
REVISION DATE:	AUGUST 1, 1988
APPLICABILITY:	All WJ-8718 Series Receivers
CHANGE INFORMATION:	Modification of the 3rd LO Output Level
CHANGE:	Change the second sentence of step number 5 of paragraph 4.3.5.18.1, on page 4-50 of the WJ-8718 HF Receiver Instruction Manual

FROM:

"The voltmeter should indicate -6 dBm +/-2 dB."

TO:

"The voltmeter should indicate -8 dBm minimum".

ERRATA: None

WJ-8718 SERIES HF RECEIVER
CHANGE 1

TITLE:	INSTRUCTION MANUAL FOR THE WJ-8718 SERIES HF RECEIVER
MANUAL DATE:	October 1983
CHANGE 1 DATE:	July 1990
APPLICABILITY:	All units.
CHANGES/ERRATA INFORMATION:	Changes refer to updates of the manual to cover design modifications. Errata refer to corrections and clarifications of information in the manual.
CHANGE SUMMARY:	This change covers a correction to Section IV of the manual regarding measured signal levels in the RF Filter assembly. It also reflects minor, non-electrical modifications to schematic diagram 51198 for the Type 791629 Voltage-Controlled Oscillator, A5A1A1.

ERRATA:

Paragraph 4.3.5.2.1, step 6, correct the sentence to read as follows:

6. The RF Voltmeter should indicate a level between 0 dBm and -2.0 dBm.

CHANGES:

Replace **Figure 6-16, Type 791629 1st LO VCO Assembly (A5A1A1),** with the attached drawing.

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7.1	General	7-1
7.2	Electrical Differences	7-1
7.3	Mechanical Differences	7-1
7.4	Replacement Parts List and Schematic Diagrams	7-1

LIST OF ILLUSTRATIONS

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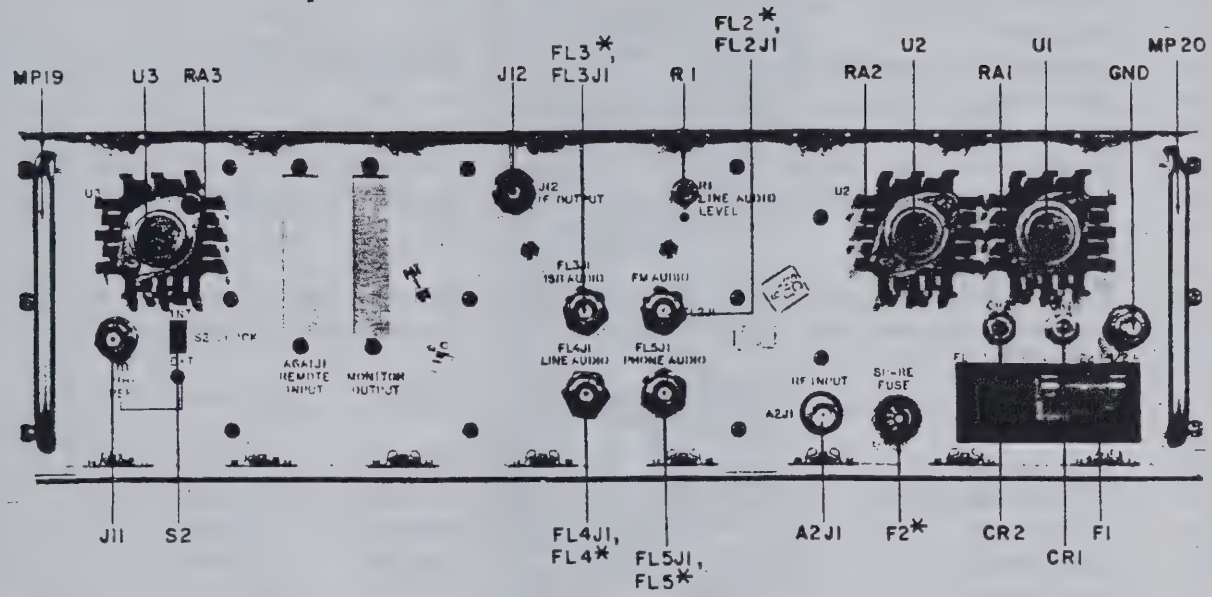
7-2	Type 796010 RF Filter	7-6
7-3	Phone Jack Assembly	7-10
7-4	Type 280017 Audio Attenuator	7-11

Mfr. Code	Name and Addresss
04013	Taurus Corporation 1 Academy Hill Lambertville, NJ 08530

7.5 TYPE WJ-8716 HF RECEIVER, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
	With the exception of those items listed below, the WJ-8716 HF Receiver is electrically identical to the WJ-8718 HF Receiver.				
A2	RF Filter	1	796010	14632	
A10	Front Panel Control	1	791684-3	14632	
A11	Phone Jack Assembly	1	796011	14632	
A12	Audio Attenuator	1	280017	14632	
E5	Terminal, Feedthru	4	SFU16Y	04013	
E6	Same as E5				
E7	Same as E5				
E8	Same as E5				
FL2	Filter, LP	4	52-713-301	33095	
FL3	Same as FL2				
FL4	Same as FL2				
FL5	Same as FL2				
J13	Not Used				
P21	Faston Receptacle	6	42236-1	00779	
P25	Connector, Plug, Receptacle	4	2-350804-2	00779	
P26	Same as P21				
P27	Same as P25				
P28	Same as P21				
P29	Same as P21				
P32	Same as P21				
P49	Same as P25				
P50	Same as P21				
P51	Same as P25				
T1	Transformer	1	SCD34518	14632	
T2	Not Used				
TB1	Not Used				
TB2	Not Used				



*DENOTES HIDDEN PART

Figure 7-1. WJ-8716 Main Chassis Rear Panel View
Location of Components

7.5.1 TYPE 796010 RF FILTER REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.47 μF, 20%, 100 V	2	8131M100-651-474M	72982	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 20 pF, 5%, 500 V	1	CM05ED200J03	81349	72136
C4	Capacitor, Mica, Dipped: 68 pF, 2%, 500 V	1	CM05ED680G03	81349	72136
C5	Capacitor, Mica, Dipped: 10 pF ± 0.5 pF, 500 V	2	CM05CD100D03	81349	72136
C6	Capacitor, Mica, Dipped: 180 pF, 2%, 500 V	3	CM05FD181G03	81349	72136
C7	Same as C5				
C8	Same as C6				
C9	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	1	CM05ED270G03	81349	72136
C10	Same as C6				
C11	Capacitor, Mica, Dipped: 15 pF, 5%, 500 V	2	CM05CD150J03	81349	72136
C12	Capacitor, Mica, Dipped: 200 pF, 2%, 500 V	2	CM05FD201G03	81349	72136
C13	Capacitor, Mica, Dipped: 220 pF, 2%, 500 V	1	CM05FD221G03	81349	72136
C14	Same as C11				
C15	Same as C12				
C16	Capacitor, Mica, Dipped: 120 pF, 2%, 500 V	1	CM05FD121G03	81349	72136
C17	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	2	CM05ED470G03	81349	72136
C18	Same as C17				
CR1	Diode	2	1N4449	80131	93332
CR2	Same as CR1				
E1	Terminal, Forked	1	140-1941-02-01	71279	
J1	Connector, Receptacle	1	UG1094/U	80058	74868
L1	Coil, Torroidal	2	20681-186	14632	
L2	Coil, Torroidal	1	20681-187	14632	
L3	Same as L1				
L4	Coil, Torroidal	2	20681-188	14632	
L5	Coil, Torroidal	2	20681-189	14632	
L6	Same as L5				
L7	Same as L4				
L8	Inductor	1	21209-37	14632	
L9	Coil, Torroidal	1	20681-202	14632	
P1	Connector, Plug	1	UG1466/U	80058	19505
R1	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
VR1	Diode, Zener: 6.2 V	2	1N753A	80131	04713
VR2	Same as VR1				

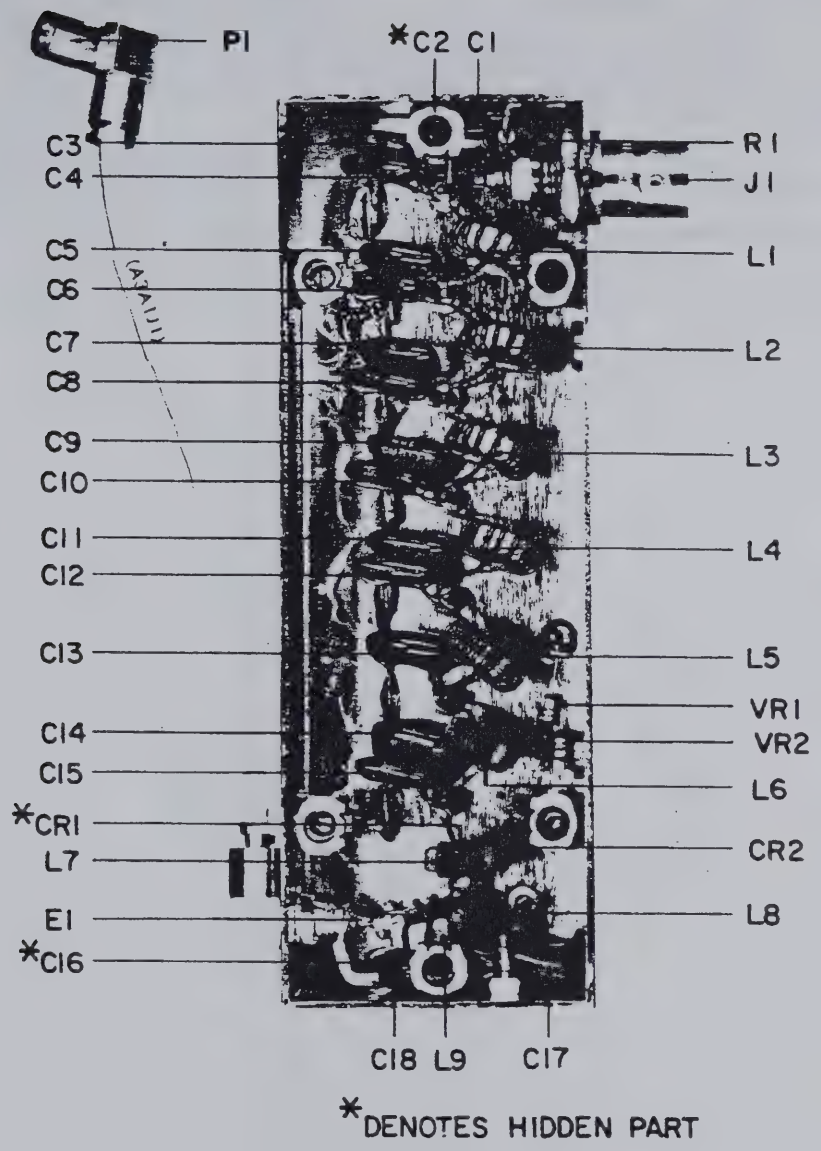


Figure 7-2. Type 796010 RF Filter, Location of Components

7.5.2 TYPE 791684-3 FRONT PANEL CONTROL REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
	With the exception of the item listed below, type number 791684-3 is electrically identical to type number 791684-2 designated as A10 in the WJ-8718 HF Receiver.				
A2	Lower Panel Control	1	791826-2	14632	

7.5.2.1 Type 791826-2 Lower Panel Control REF DESIG PREFIX A10A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
	With the exception of those items listed below, type number 791826-2 is electrically identical to type number 791826-1 designated as A10A2 in the WJ-8718 HF Receiver.				
R3	Resistor, Fixed, Composition: 620 Ω, 5%, 1/4 W	2	RCR07G621JS	81349	01121
R4	Same as R3				
R5	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R7	Same as R5				

7.5.3 TYPE 796011 PHONE JACK ASSEMBLY REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
CR1	Diode (Not Shown)	4	1N4449	80131	93332
CR2	Same as CR1 (Not Shown)				
CR3	Same as CR1 (Not Shown)				
CR4	Same as CR1 (Not Shown)				
E1	Terminal, Standoff: Ground	1	160-2380-01-05-00	71279	
FL1	Filter, EMI	2	51-353-314	33095	
FL2	Same as FL1				
J1	Connector, Phone Jack	1	L12B	82389	

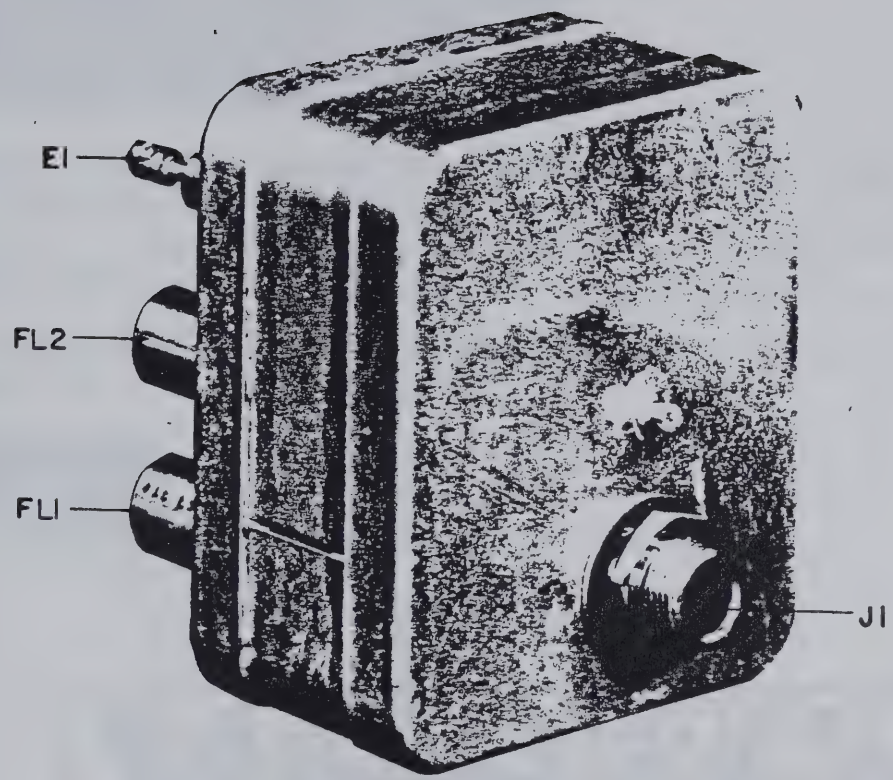


Figure 7-3. Phone Jack Assembly,
Location of Components

7.5.4 TYPE 280017 AUDIO ATTENUATOR REF DESIG PREFIX A12

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Electrolytic, Tantalum: 4.7 μF, 10%, 35 V	1	CS13BF475K	81349	56289
E1	Terminal	10	140-1941-02-01	71279	
E2 Thru E10	Same as E1				
R1	Resistor, Fixed, Composition: 750 Ω, 5%, 1/4 W	6	RCR07G751JS	81349	01121
R2	Resistor, Fixed, Composition: 560 Ω, 5%, 1/4 W	3	RCR07G561JS	81349	01121
R3	Same as R1				
R4	Same as R1				
R5	Same as R2				
R6	Same as R1				
R7	Same as R1				
R8	Same as R2				
R9	Same as R1				
R10	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121

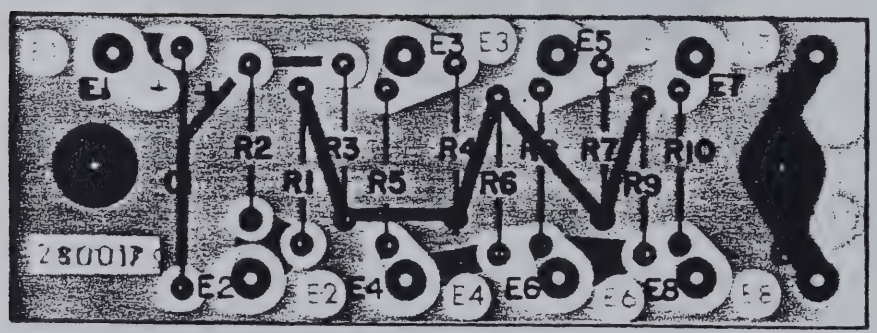


Figure 7-4. Type 280017 Audio Attenuator, Location of Components

WJ-8716 receivers

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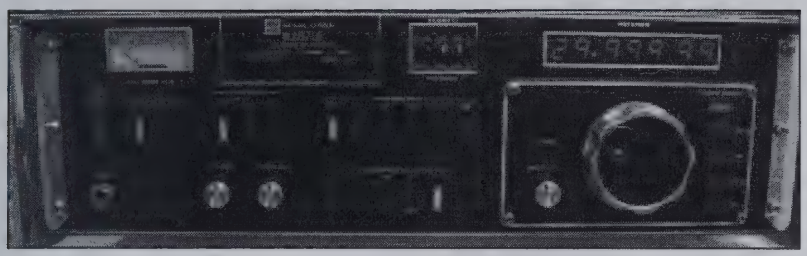
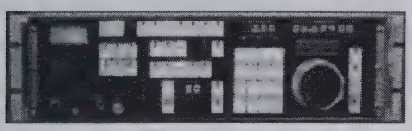


This is the front panel of a WJ-8716 receiver. These receivers are relatively common although internal options vary and some of the options are rare.

WJ-8716 available options

WJ-8716 manual supplement. The WJ-8716 is identical to the WJ-8718 excpet for the production changes detailed in this document.



MFP - Micrprocessor Front Panel version

WJ-8716 and WJ-8718 Receiver Option 06-03-04

232	RS-232 I/O remote control
232M	RS-232 I/O for MFP option
488-2	IEEE-488 I/O remote control
488M	IEEE-488 I/O for MFP option
B10	10 Hz BFO tuning
COM	command input module
COR	carrier operated relay
DDC	dual diversity combiner
EM	extended memory (100 channels)
FSK	frequency shift keying
GRN	green LED display
ISB	independent sideband
LLA	low level audio output
MCM	manual control module (standard front panel)
MCM-2	manual control module (difference from MCM unknown)
MFP	microprocessor front panel (extensive - radically alters appearance)
MFS	mainframe spares module
MON	status monitor module
NAV	Navy option (alters front panel)
PRE	preselector
RED	red LED display
SMO	spectrum monitor output
TK	tool kit
1HZ	one hertz tuning rate

Note: The differences between an 8716 an 8718 are minor. The 8716 is rumored to be the Tempest version (EMI hardened) but examination of several units has revealed only minor differences in shielding and filtering on four rear panel connectors.

MFP option for the WJ-8716 and WJ-8718

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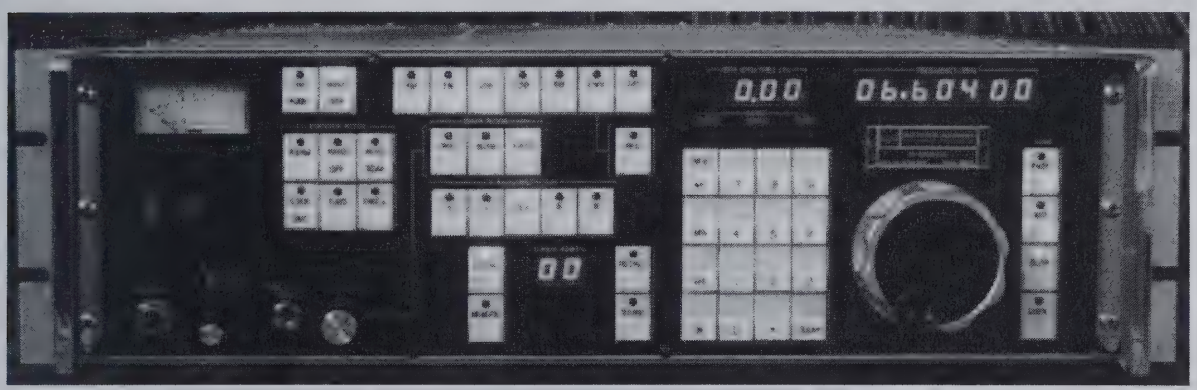
The Microprocessor Front Panel (MFP) option radically changes the nature of these radios. The front panel is completely different with keypad entry, 99 memory channels, search and scan functions.



This is a WJ-8718A/MFP. The WJ-8716A/MFP looks identical from the front.

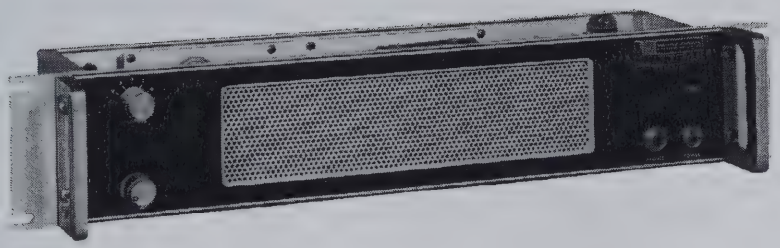
More to follow

Technical Data

WATKINS-JOHNSON

February 1997

Speaker Panels
S-9903E & WJ-9954



HEIGHT 3.5 in (8.89 cm) **DEPTH** 6 in (15.24 cm)
WIDTH 19 in (48.26 cm) **WEIGHT** 5.5 lbs (2.49 kg)

S-9903E

Operators use the S-9903E with receiving systems, and as line- and playback-monitors for multichannel tape recorder systems. The versatile unit requires a minimum of rack space, yet provides high-quality audio reproduction and response. It contains integral, low-watt output, solid-state amplifiers, and power supplies. Front-panel switches allow the selection of audio from one of several inputs.

HEIGHT 3.5 in (8.89 cm) **DEPTH** 7 in (17.78 cm)
WIDTH 8 in (20 cm) **WEIGHT** 4 lbs (1.80 kg)

WJ-9954

The WJ-9954 Speaker Panel is a compact, half-rack unit designed for receiving systems, and as a line or playback monitor for tape recorder systems. It can have one or eight switch-selectable channels with:

- Volume control
- Equalization (tone) control
- On/off switch
- Pilot light
- Channel-activity lights
- Headphone jack

WATKINS-JOHNSON COMPANY
700 Quince Orchard Road, Gaithersburg, Maryland 20878-1794
Phone: (800) WJHELPS or +(301) 948-7550
FAX: +(301) 921-9479 Email: wj.helps@wj.com Website: www.wj.com

All International sales of WJ equipment are subject to USA export license approval.
This material provides up-to-date general information on product performance and use. It is not contractual in nature, nor does it provide warranty of any kind.

Printed in the U.S.A.

Specification subject to change without notice.

Specifications	WJ-9903E[1]	WJ-9954
Front-panel Controls	Vol/tone/on-off	Vol/tone/on-off 8-channel version - channel select
Activity Indicators	N/A	Active channels light on 0-dBm level, 0.1 Vrms, min
Number of Inputs	7	1 or 8
Input Impedance	10-k ohms	10-k ohm
Input Connectors	BNC	BNC
Output Connectors	Headphone jack	N/A
Maximum Input Level	7.5 V	2.5 V
Maximum Output Level	5 W, max	5 W, typical
Response		
Amplifier	75 Hz to 10 kHz at 3-dB points	N/A
Speaker	N/A	<150 Hz to 12 kHz
Headphone	N/A	50 Hz to 20 kHz
Power Input	115/230 Vac +10% 48 to 420 Hz	115/220 Vac 50 to 60 Hz
Power Consumption	16 W, approx	10 W, max
Operating Temperature Range	0 to 50°C	0 to 50°C
Speaker Size		
Height	2.5 in (6.35 cm)	2.5 in (6.35 cm)
Width	10 in (4.53 cm)	4 in (10.16 cm)
Options	N/A	WJ-9954/MK1[2] Mounting Panel WJ-9954/MK2[3] Mounting Frame WJ-9954/MK2[4] Mounting Frame

[1] Normally used to bridge, rather than terminate, the output of a receiver or line.

[2] Mounts 2 speaker units. Overall size: 3.5 in (8.89 cm) x 19 in (48.26 cm). Maximum depth with speakers is 3 in (7.62 cm).

[3] Mounts 1 speaker and 1 blank panel into a full rack.

[4] Mounts 1 speaker with any one of several auxiliary devices including signal monitors or frequency counters. Overall size: 3.5 in (8.89 cm) x 15.6 in (39.62 cm).

Spectrum Display Units

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This is a Communications Electronics, Inc SM-8512-6 spectrum display unit. It was designed for surveillance use with the Collins designed R-390(A) series of radios. It came with instructions for modifying the R-390(A) for wideband IF output. This unit has a 455 kHz IF and can display 5, 20 or 50 kHz of the spectrum. It uses nuvistors throughout the signal chain and a few early germanium transistors in the power supply.

SDU basic information guide for both CEI and WJ units

more to follow

Communications Electronics, Inc.
and Watkins Johnson
Spectrum Display Units Guide

06/03/04

This is an ongoing project. I'm always looking for more information, particularly on the variants denoted by the -x suffixes.
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All units are rack mount 3.5" high unless noted.

Model	IF	Bandwidths	Notes
605	21.4 mHz	variable	solid-state, 1"x3" CRT
IP-751			military version of SM-9310A
IP-1059	21.4mHz	30/100/500kHz/ 3mHz	solid-state, 8cm x 10cm CRT, linear/log, full rack width 5.25" high, military version of SM-7301
IP-1355	10mHz	0-1mHz	military version of WJ-9180-1
PD-102			remote SDU for RS-112 microwave Pan-Man receiving system
PD-201			remote SDU same as PD-102 except 1/2 rack width
PD-602	160mHz	1mHz	solid-state, 8cm x 10cm CRT, component of RS-112, half rack 5.25" high, mount in EF-602
SM-1622	160 mHz	20mHz max	nuvistors or solid-state, 1"x3" CRT, 200kHz resolution, 1/2 rack width
SM-1622-1	160mHz	20mHz max	same as SM-1622 except with 1mHz resolution
SM-1662	160mHz	20mHz	solid-state, 1"x3" CRT, 250kHz resolution, half rack width 3.5" high, 11lbs
SM-1662-1	160mHz	20mHz	same as SM-1662 except with 1mHz resolution
SM-4300	21.4mHz	3mHz	solid-state, 1"x3" CRT, 21.4mHz marker, 1/3 rack width, 5" high

SM-4301A	21.4mHz	3mHz	solid-state, 1"x3" CRT, 21.4mHz marker, 1/4 rack width, 6.75" high, 7.5lbs, cost $850 (1967)
SM-6108	84kHz	44kHz	solid-state, 1"x3" CRT, designed for displaying 64-108kHz subcarriers, 1/2 rack width, 3.5" high
SM-7301	21.4mHz	30/100/500kHz/ 3mHz	solid-state, 8cm x 10cm CRT, linear/log, part of RS-160 receiving system, full rack width 5.25" high, SM-7301 occupies half of rack w/ provisions for DRO-308 in the other half
SM-8421	2mHz	3/15/50kHz	solid-state, 1" x 3" CRT, marker generator, sweep disable, H&V outputs, (internally converts 2mHz to 455mHz), for use with VLF receivers like the 354, 355 and 357, 12lbs, cost $2500 (1968)
SM-8510	500kHz	5/20/50kHz	nuvistors & solid-state, 1"x3" CRT, lin/log display, 15lbs, cost $1400 (1967) mod kit for pairing w/ Collins 51J-4 or 51S-1 was included
SM-8511	500kHz	5/20/50/200kHz	same specs as SM-8510 except wider sweep width, cost $1600 (1967)
SM-8512	455kHz	5/20/50kHz	same specs as SM-8510 except for IF input freq, cost $1400 (1967) mod kit for pairing with R-390 or R-390A was included
SM-8513	455kHz	5/20/50kHz	two SM-8512 units in 5.25" high side by side rack mount, cost $2900 (1967)
SM-9188	455kHz	5/15/30 kHz	for use with 8718 series
SM-9205	21.4mHz	variable to 5mHz	SDU for use w/up to three receivers, displays three traces simultaneously, digitally refreshed LCD display, common adjustments like sweep rate and centering are automatic, all

			three traces can be adjusted independently via manual or IEEE-488 remote control, 1/2 rack width 3.5" high.
SM-9206	21.4mHz	0.1/0.2/0.4/1/2/ 5mHz	simplified 9205, single trace, 3 selectable inputs, CRT display, 1/2 rack width 3.5" high.
SM-9301	21.4mHz	3mHz	solid-state, 1"x3" CRT, 21.4mHz marker, 8lbs, cost $850 (1967)
SM-9302	21.4mHz	3mHz	half rack version of SM-9301, 7lbs, cost $800 (1967)
SM-9303A	21.4mHz	3mHz	solid-state, 1"x3" CRT, input bandpass filtering, MOS FET first mixer, 21.4mHz marker, 11lbs, cost $1000 (1967)
SM-9304A	21.4mHz	3mHz	half rack version of SM-9303, 10lbs, cost $950 (1967)
SM-9310A	21.4 mHz	variable 3mHz max	nuvistors, 1"x3" CRT (mil IP-751)
SM-9310-1	21.4 mHz	variable 3mHz max	nuvistors, 1"x3" CRT, coaxial switch added for mult sources
SM-9401B	21.4mHz	4mHz	solid-state, 1"x3" CRT, 21.4mHz marker, 8lbs
SM-9402A	21.4mHz	4mHz	half rack version of SM-9401B, 7lbs
SM-9403A	21.4mHz	4mHz	same specs as SM-9303A except wider sweep width
SM-9404A	21.4mHz	4mHz	half rack version of SM-9403A
SM-9801	21.4mHz	8mHz	same specs as SM-9301, cost $950 (1967)
SM-9802A	21.4mHz	8mHz	half rack version of SM-9801A, cost $900 (1967)
SM-9803A	21.4mHz	8mHz	same specs as SM-9303A except wider sweep width
SM-9804A	21.4mHz	8mHz	half rack version of SM-9803A
SM-9805A	21.4mHz	8mHz	solid-state, 2.625" x 4.625" CRT, avail with P1 or P7 phosphor

SM-9831	30mHz	8mHz	solid-state, 1"x3" CRT, 30mHz marker, 8lbs, cost $950 (1967)
SM-9832	30mHz	8mHz	half rack version of SM-9831
SPD-214	21.4mHz	3mHz max	nuvistors, 1/2 rack width
WJ-9180-1	10mHz	0-1mHz	5-25Hz sweep rate, 10uV input sensitivity, battery powered (10 D-cell or magnesium BA-4386 pack) or 24VDC vehicular supply, designed to accompany WJ8640-1 receiver (mil IP-1355/GRR-8V)
WJ-9188A	455kHz	5/30kHz	solid-state, 1'x3" CRT, marker, half rack width
WJ-9188A-18	455kHz	5/15/30kHz	2.5" x 3" CRT, used with WJ-8888B or WJ-8718 w/ SMO option, full rack width
WJ-9205	21.4mHz	5kHz-5mHz	4" CRT, displays 3 simultaneous traces, auto sweep and centering, IEEE-488 interface, 3.5"h x 8.5"w x 22"d, 18lbs
WJ-9206	21.4mHz	0-5mHz	4" CRT, single trace, 3.5"h x 8.5"w x 22"d, 17lbs
WJ-9207			RF panoramic display unit, digitally refreshed EL flat panel display, display 4 simultaneous scans, companion to WJ-8607 miniceptors (req WJ-8607/DSO option), 5.25"h x 8.75"w x 22"d, 13lbs
WJ-9209	455kHz	5/15/30kHz	combination SDU and speaker unit, 2.5" x 3" CRT, five input selector for speaker, half rack width 5.25" high

Communications Electronics, Inc.
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Receivers and Tuners Guide

06/03/04

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Model	Coverage	Bandwidths	Notes
112	1-18gHz TH-series drop-in tuners	100kHz/2/4/10/ 20mHz	receiver, AM/FM/pulse, filmstrip dial, AFC, DAFC, "aural enhancement", dual conversion, IFs: 160 & 21.4mHz, center tune and signal strength meters, solid-state, 23lbs
112-1	1-18gHz	100/500kHz/1/ 10/20mHz	same as 112 except for BW
112-5	4-8gHz	1/2/4/10/20MHz	same as 112 except for BW and coverage
112R	1-18gHz		EMC version of 112
205	2-1000mHz HH-, VH- or UH- series tuners	10/50/300khz/ 1mHz	Pan-Man receiver, filmstrip dials, AM/FM/pulse, scans pan (full band) or sector (adjustable width centered on tuner frequency), center tune and signal strength meters, 21.4mHz IF, solid-state, 19lbs
205-2			similar to 205 except with additional scan mode of pan/sector (alternates traces), and remote tune
205-3		300kHz/1/3/5mHz	otherwise similar to 205-2
205-28		50/300kHz/1/2mHz	otherwise similar to 205-2
205-46		300kHz/1/2/3mHz	otherwise similar to 205-2
215			similar to 205-2 except w/ TTL digital remote interface
232-1	2-32mHz	6kHz	tunable filter, basically

			a triple conversion rcvr w/o demod, IFs=65mHz/10mHz and 15kHz, 6kHz BW filter, COR, DAFC input (from DRO-307-1), 1/2 rack width
232-2	2-32mHz	6kHz	same as 232-1 except with 25kHz final IF
301A	3-30kHz	200Hz	round dial, AM/CW, three band 3-6/6-14/14-30kHz, 45kHz IF, AGC, solid-state, 14lbs, cost $1000 (1967)
301A-1	3-30kHz	200Hz	same as 301A but w/optional internal rechargeable batt, cost $1200 (1967)
302	30-300kHz	2kHz	round dial, AM/CW, three band 30-60/60-140/140-300 kHz, 455kHz IF, AGC, solid-state, 13.5lbs, cost $1000 (1967)
340A	1-900kHz	1/6/20/50kHz	5 digit LED counter, AM/FM/CW, DAFC, ant attn, 50/600 ohm ant, remote control, solid-state
340A-4	1-900kHz	0.15/1/3/30kHz	same as 340A except for BW
340A-6	1-900kHz	0.15/1/20/75kHz	same as 340A except for BW
340A-7	1-900kHz	0.4/1/2/5/10kHz	same as 340A except for BW
340A-8	1-900kHz	0.3/1/3/20/50kHz	same as 340A except for BW
351	1-600kHz	0.15/1/3/6kHz	4 digit Nixie counter, decimal shift, DAFC, AM/SSB/CW/FSK,BFO w/zero/variable/1kHz/USB/LSB, ant attn, audio BW filters, solid-state, 20lbs, cost $4000 (1967)
351-1	1-600kHz	1/6/20/50kHz	AM/FM/USB/LSB/CW/Pulse, filmstrip dial, solid-state, ant. atten., BFO w/var/5.5kHz/USB/LSB
354	1-600kHz	0.15/1/3/6kHz	filmstrip dial, AM/SSB/CW/FSK, BFO w/zero/variable/5.5kHz/USB/LSB, ant attn, audio BW filters, solid-state, 20lbs, cost $2500 (1967)

355	1-600kHz	1/6/20/50kHz	filmstrip dial, AM/SSB/CW/ FSK, BFO w/zero/variable/ 5.5kHz/USB/LSB, ant attn, audio BW filter, solid-state, 20lbs, cost $3000 (1967)
355-1	1-600kHz	1/6/20/50kHz	same as 355 w/addition of X-Y outputs to driver plotter, cost $3200 (1967)
355-2	1-600kHz	1/6/20/50kHz	same as 355 w/addition of internal rechargeable batteries, cost $3700 (1967)
357	1-600kHz	0.15/1/3/6kHz	4 digit Nixie counter, decimal shift, DAFC, AM/ SSB/CW/FSK, BFO w/zero/ variable/5.5kHz/USB/LSB, noise limiter, audio BW filter, 2mHz IF, solid-state, (have manual) (mil versions: R-1401 and R-1490A/G), 20lbs, cost $4200 (1967)
371A	0.5-10mHz	6/20/100/400kHz	AM/FM/CW, filmstrip dial, dual conversion on 6&20kHz IF BWs (21.4mHz & 455kHz), LO out, SM out (21.4mHz), designed for RFI detection, solid-state, 25lbs, cost $3000 (1968)
372A	0.5-30mHz	6/20/100/400kHz	AM/FM/CW, filmstrip dial, designed for RFI detection, solid-state
372A-2	0.5-30mHz	6/20/100/400kHz	same as 372A except has X-Y outputs for recording spectral
373A	0.5-30mHz	6/20/100/400kHz	AM/FM/CW, filmstrip dial, dual tuner version of 371A, 25lbs, cost $3500 (1968)
373A-2	0.5-30mHz	6/20/100/400kHz	same as 373A except has X-Y outputs for recording spectral analysis
373A-6	0.5-30mHz	0.15/1/20/75kHz	same as 373A except for BW
373A-10	0.5-30MHz	2/20/100/400kHz	same as 373A except for BW
377A	0.5-10mHz	6/20/100/400kHz	AM/FM/CW, 6 digit Nixie counter display, DAFC, dual conversion on 6&20kHz

			IF BWs, SM output, solid-state, 25lbs, cost $4500 (1967)
402-1	20-40mHz	10kHz	1 chan xtal controlled, AM/CW, 21.4mHz IF, 1/5 rack width, 5.25" high, 4.5lbs, cost $995 (1965)
402-2	40-60mHz	10kHz	same as 402-1
402-3	60-90mHz	10kHz	same as 402-1
410	20-80mHz	10kHz	plug-in receiver, AM/FM, activity operated relay (AOR), DAFC input, mounts in EF-158 as part of RS-158
410-2	20-80mHz	20kHz	same as 410
410-3	20-80mHz	50mHz	same as 410
415-1	60-90mHz	50kHz (100kHz - special order)	4 chan xtal controlled, AM only, 21.4mHz IF, 1/4 rack width, 3.75" wide, 6.75" high, 6.5lbs, cost $995 (1966)
415-2	75-110mHz	50kHz	same as 415-1
415-3	90-130mHz	50kHz	same as 415-1
415-4	110-150mHz	50kHz	same as 415-1
416-1	30-90mHz	2mHz	4 chan xtal controlled, pulse only, other specs like 415
416-2	75-110mHz	2mHz	4 chan xtal controlled, pulse only, other specs like 415
416-3	90-130mHz	2mHz	4 chan xtal controlled, pulse only, other specs like 415
416-4	110-150mHz	2mHz	4 chan xtal controlled, pulse only, other specs like 415
416-6	30-90mHz	unknown	4 chan xtal controlled, other specs unknown
416-12	60-260mHz	unknown	same as 416-6
440-1	30-48mHz	20/50/75 or 100 kHz	xtal control rcvr, AM only, 1/6 rack width, second

			suffix denotes bandwidth -1 =50kHz, -2 =20kHz, -3 =75kHz -4 =100kHz
440-2	45-72mHz		other specs same as 440-1
440-3	70-105mHz		other specs same as 440-1
440-4	100-160mHz		other specs same as 440-1
440-5	150-220mHz		other specs same as 440-1
440-6	210-260mHz		other specs same as 440-1
441-1	30-48mHz	20/50/75 or 100 kHz	xtal control rcvr, FM only, 1/6 rack width, second suffix denotes bandwidth -1 =50kHz, -2 =20kHz, -3 =75kHz -4 =100kHz fit EF-506B rack
441-2	45-72mHz		other specs same as 440-1
441-3	70-105mHz		other specs same as 440-1
441-4	100-160mHz		other specs same as 440-1
441-5	150-220mHz		other specs same as 440-1
441-6	210-260mHz		other specs same as 440-1
461-1	300-450mHz	see descrip	single xtal channel, AM/FM, BWs noted by 2nd suffix: -1 =50kHz, -2 =20kHz, -3 =75kHz -4 = 100kHz 1/6 rack width, fit EF-506 rack
461-2	450-550mHz		same as 461-1
480 series			these tuners are listed under components as they require the supply in the EF-180A or EF-182A rack
501	54-260mHz	10/300kHz	round dial, AM/FM/CW, video BW filters, built-in speaker, center tune and signal strength meters, 21.4mHz IF, solid-state, nuvistors & 7077
501A	54-260mHz	10/300kHz	filmstrip dial, AM/FM/CW, video BW filters, built-in speaker, center tune and signal strength meters, 21.4mHz IF, solid-state, 15lbs, cost $1600 (1967)

501A-1	54-260mHz	10/300kHz	same as 501A except w/AFC
504A	54-260mHz	10/300kHz	same as 501A w/addition of 1 & 5mHz marker generator, cost $1750 (1967)
519	20-70mHz	10/50/300kHz	filmstrip dial, AM/FM/CW, squelch, built-in SDU, dual conversion, 10mHz & 455kHz IFs, DAFC input (for DRO-290A), solid-state, 18lbs, cost $3100 (1967) (have manual)
521A	20-70mHz	4/10/50kHz	filmstrip dial, AM/FM/CW, COR, built-in SDU, dual conversion, 10mHz & 455kHz IFs, DAFC input (for DRO-209A), solid-state, 18lbs, cost $3200 (1967)
521A-1	20-80mHz	4/10/50kHz	other specs same as 521A
555	90-180mHz	10/20/50kHz	other specs similar to 521A
555-1	90-180mHz	4/10/50kHz	other specs similar to 521A
565	20-1000mHz (VH- & UH- plug-in tuners)	10/50/100kHz/ 3mHz	AM/FM/CW/pulse, built-in SDU, DAFC input
565A	20-1000mHz	opt w/ WJ-9930 modules	same as 565 except uses drop-in IF/BW/demod units
595	220-440mHz	10/20/50kHz	other specs similar to 521A
601A	54-260mHz	50/100kHz	round dial, AM/CW, squelch, dual conversion, 21.4mHz & 2.5mHz IFs, two separate IF strips, 50 & 100kHz BWs avail. simultaneously, solid-state & nuvistor, 12lbs, (1964)
701	235-1000mHz	300kHz/2mHz	round dials, AM/FM/CW, two tuners: 235-500/490-1000mHz, COR, dual conv., 60mHz & 21.4mHz IFs, two separate IF strips, 300kHz & 2mHz BWs avail. simult., solid-state, nuvistor, 7077s & 7486, 21lbs
701A	235-1000mHz	300kHz/2mHz	same as 701 except 7077s & 7486 replaced by nuvistors, cost $3000 (1965)

702	235-1000mHz	50/300kHz/2mHz	same as 701 except w/50kHz bandwidth
702A	235-1000mHz	50/300kHz/2mHz	same as 702 except 7077s & 7486 replaced by nuvistors, cost $3500 (1965)
770	235-1000mHz	100/500kHz/4mHz	round dials, AM/FM/CW/ pulse, two tuners: 235-500/ 490-1000mHz, IFs: 60, 21.4mHz (all BWs), 2.5mHz (100kHz only), nuvistors, several 7077s & 7486, solid-state
770A	235-1000mHz	100/500kHz/4mHz	same as 770 except 7077s and 7486 replaced by nuvistors
775	235-1000mHz	100/500kHz/4mHz	same as 770A except w/COR
775-3	235-1000mHz	100/500kHz/4mHz	same as 775 except w/115/ 230VAC supply, cost $3700 (1967)
775-9	235-1000mHz	100/500kHz/4mHz	difference unknown
901B	30-300mHz	20/300kHz	filmstrip dials, AM/FM/CW, two tuners: 30-90/60-300 mHz, nuvistor and solid-state, 18lbs, cost $1925 (1966)
901-5	30-300mHz	20/30/300kHz	same specs as 905A except for additional IF BW
903B	30-300mHz	50/300kHz	round dial, AM/FM/CW, ANL, COR, two tuners: 30-60/60-300mHz, 21.4mHz IF, nuvistors (8058, 7587 & 6CW4) & solid-state, 20lbs, cost $2400 (have partial schematic)
904A	30-300mHz	20/300kHz	same as 901B except with 1mHz & 5mHz xtal marker osc, cost $2075 (1966)
905A	30-300mHz	20/300kHz	same as 901B except with COR, cost $2025 (1966) (mil R-1420/URR)
906A	30-300mHz	20/300kHz	same as 901B except with 1mHz & 5mHz xtal marker osc and COR, cost $2175 (1966)

906A-4	30-300mHz	20/300kHz	same as 906A except with narrow band FM demod
907	30-300mHz	20/300kHz	round dial, AM/FM/CW, two tuners: 30-100/60-300 mHz, special DC outputs from detectors, 21.4mHz IF, nuvistor & solid-state, 15lbs, cost $1975 (1965)
952	30-300mHz	50/300kHz	filmstrip dial, AM/FM/CW, two tuners: 30-90/60-300 mHz or six xtal controlled chan between 100-150mHz, COR, 21.4mHz IF, 18lbs, cost $2400 (1967)
960	30-300mHz	20/200kHz	round dials, AM/FM/CW, two tuners: 30-90/60-300 mHz, 21.4mHz IF, nuvistors, 7077 & solid-state, 16lbs
960B	30-300mHz	20/200kHz	same as 960 except 7077s replaced by nuvistors, cost $2550 (1966)
960B-2	30-300mHz	20/300kHz	same as 906B except with wider IF BW
965	10-90mHz	10/50/200kHz	round dials, AM/FM/CW, two tuners: 30-90/10-30mHz, 21.4mHz IF, 17lbs, cost $2900
970A	30-300mHz	60/300kHz/3mHz	round dials, FM/AM/CW/ pulse, special AGC for pulse, dual conversion (60kHz BW only) 21.4mHz & 2.5mHz IFs, cost $2700 (1965)
975	30-300mHz	60/300kHz/3mHz	same as 970A except with COR, cost $2800 (1965)
975-2	30-300mHz	60/300kHz/3mHz	newer version of 975, cost $2700 (1967)
977	30-300mHz	60/300khz/3mHz	filmstrip dials, AM/FM/CW/ pulse, solid-state, DAFC w/DRO-300A or DRO-302A-2, cost $2700 (1968)
977-1	30-300mHz	10/300kHz/3mHz	other specs same as 977
CT-4080	4-8gHz	8mHz minimum	tuner, one 160mHz output, two 21.4mHz output, 18dB max noise figure, AGC & DAFC inputs, 25lbs, used

			in RS-125, cost $6250 (1968)
CV-1750	235-1000mHz	2mHz minimum	military version of FE-25-1
FE-1-2A	0.95-2.05gHz	8mHz minimum	converter, filmstrip dial, 160mHz IF out, 18dB max noise figure, four section YIG preselector, LO out, 20lbs, cost $4000 (1965)
FE-1-2B	0.99-2.0gHz	8mHz minimum	same as FE-1-2A except DAFC in, AGC in, slightly wider frequency range, 25lbs, cost $4000 (1967)
FE-1-4.5	0.95-4.5gHz	8mHz minimum	converter, consists of the tuner sections of FE-1-2B and FE-2-4.5 in one box, cost $8500 (1967)
FE-2-4	2.0-4.0gHz	8mHz minimum	converter, round dial, 160mHz IF out, 18dB max noise figure, tunable YIG preselector, AGC in, rack mount 5.25" high, 20lbs, cost $4000 (1965)
FE-2-4.5	1.95-4.5gHz	8mHz minimum	same specs as FE-1-2B except freq coverage
FE-4-8	4-8gHz	8mHz minimum	converter, filmstrip dial, 160mHz IF out, 18dB max noise figure, four section YIG preselector, DAFC in, AGC in, LO out, 25lbs, cost $6500 (1967)
FE-8-12	8-12gHz	8mHz minimum	converter, filmstrip dial, 160mHz IF out, 18dB max noise figure, four section YIG preselector, DAFC in, AGC in, LO out, 25lbs, cost $6500 (1967)
FE-25-1	235-1000mHz	2mHz minimum	converter, round dials, two tuners: 235-500/490-1000mHz, 60 mHz IF out, 10 dB noise figure, 7077s, 7486 & nuvistors, 18lbs, cost $1400 (1967) (mil version: CV-1750)
FE-26	235-1000mHz		other specs unknown
FE-103	10-30mHz	2mHz minimum	converter, 60 mHz IF out, filmstrip dial, 6dB max

			noise figure, solid-state, 12lbs, cost $1000 (1965) (mil version available, number unknown)
FE-3442	3.7-4.2gHz	20mHz	converter, 160mHz IF out, 20mHz BW, 15dB noise figure compnent of TDS-100 system
HF-1000	0.005-30mHz	58 digital filters	AM/FM/CW/USB/LSB/ISB/ synchronous AM, fully synthesized, green LED digital readouts, 3 scanning modes, notch filter, bandpass tuning, RS-232 or CSMA remote control, rack mount 5.5" high, 97-253VAC, 47-440Hz, current issue commercial version of WJ-8711
HT-10	0.5-10mHz	400kHz	converter, 21.4mHz out, 7dB noise figure, input attn, 15lbs, cost $2000 (1967) used in RS-125
LT-1-2	1.0-2.0gHz	8mHz minimum	converter, round dial, 21.4mHz IF out, 18dB max noise figure, four section YIG preselector, solid-state except for ceramic triode LO, rack mount 5.25" high, 20lbs, cost $4500 (1965)
LT-1020A	0.95-2.05gHz	8mHz minimum	converter, 21.4mHz out, filmstrip dial, 18dB max noise figure, four section YIG preselector, dual conversion, 160mHz and 21.4mHz IFs, DAFC in, AGC in, 25lbs, cost $4200 (1967)
MT-112	1-18gHz*		microwave tuner frame, uses up to four TH- series tuning heads, 160mHz IF out, rack mount 5.25" high
R-1279	30-300mHz	20/300kHz	round dials, nuvistor & solid-state (mil)
R-1401			military version of 357
R-1420			military version of 905A
R-1490A/G			military version of 357

RS-111-1B	30-1000mHz	20/75/300kHz/ 2mHz	round dials, AM/FM/CW, four tuners: 30-60/60-300/ 235-500/490-1000mHz, built-in SDU, separate 2mHz IF w/AM and FM continuously available, seperate antenna inputs for VHF and UHF, nuvistors, 7077s, 7486 and solid-state, rack mount 5.25" high, 35lbs, cost $6250 (1967) (have manual) (mil URR-52B)
RS-111-1B-7	30-1000mHz	20/75/300kHz/ 2mHz	same specs as RS-111-1B except has single antenna input switched to all tuners internally and video output switched between AM & FM by front panel mode control, cost $6250 (1968)
RS-111-1B-12	30-1000mHz	20/75/300kHz /2mHz	same specs as RS-111-1B except contains a 21.4mHz marker oscillator for SDU cost $6250 (1968)
RS-111-1B-12B	30-1000mHz	20/75/300kHz /2mHz	same specs as RS-111-1B except contains a 21.4mHz marker oscillator for SDU and DAFC input, cost $6250 (1969)
S302	30-300kHz	2kHz	scanning version of 302
SCT-4080	4-8gHz	8mHz minimum	scanning version of CT-4080, 30lbs, cost $7250 (1968)
SHT-10	0.5-10mHz		scanning version of HT-10
SLT-1-2	1.0-2.0gHz	8mHz minimum	scanning version of LT-1-2, 23lbs, cost $5000 (1965) specs unknown
SLT-1020A	0.95-2.05gHz	8mHz minimum	same as LT-1020A except w/ motorized automatic tuning, 30lbs, cost $5600 (1967)
SST-1045	0.95-4.5gHz	8mHz minimum	same as ST-1045 except w/ motorized automatic tuning, 30lbs, cost $10500 (1967)
ST-1045	0.95-4.5gHz	8mHz minimum	converter, 21.4mHz out, filmstrip dials, two tuners: 0.95-2.05/1.95-4.5 gHz, 18dB max noise figure, four section YIG tuned preselector, dual

			conversion, 160mHz & 21.4mHz IFs, AGC in, DAFC in, 25lbs, cost $8700 (1967)
SST-2045	1.95-4.5mHz	8mHz minimum	sames specs as ST-2045 except with motorized automatic tuning, 30lbs, cost $5600 (1967)
ST-2045	1.95-4.5gHz	8mHz minimum	same specs as ST-1045 except with one tuner, cost $4200 (1967)
SUT-1000	235-1000mHz	6mHz minimum	same specs as UT-1000 except with motorized automatic tuning, 25lbs, cost $3250 (1967)
SVT-10	10-90mHz	2mHz minimum	same specs as VT-10 except with motorized automatic tuning, 22lbs, cost $2550 (1967)
SVT-11	10-30mHz	2mHz minimum	same specs as VT-11 except with motorized automatic tuning, 20lbs, cost $1500 (1967)
SVT-30	30-260mHz	3mHz minimum	same specs as VT-30 except with motorized automatic tuning, 21.5lbs, cost $2750 (1967)
SXT-8012	8-12mHz		scanning version of XT-8012
URR-52B			military version of RS-111
URR-74			military version of WJ-8718
UT-1000	235-1000mHz	6mHz minimum	converter, 21.4 mHz out, round dials, two tuners: 235-500/490-1000mHz, 14dB max noise figure, LO out, AGC in, 18.5lbs, cost $2500 (1967)
VT-10	10-90mHz	2mHz minimum	converter, 21.4mHz out, filmstrip dials, two tuners: 10-30/30-90mHz, 7dB max noise figure, 16lbs, cost $1800 (1967)
VT-11	10-30mHz	2mHz minimum	same specs as VT-10 except single tuner, 15lbs, cost $1000, (1967)
VT-30	30-260mHz	3mHz minimum	converter, 21.4 mHz out,

			round dials, two tuners; 30-60/54-260mHz, 6.5dB max noise figure, LO out, AGC in, 7077s & nuvistors, 15lbs, cost $2000 (1967)
WJ-1033-1	500-100mHz	20mHz	tuner, 160mHz IF output, 18dB noise figure
WJ-1034	1-2gHz	30mHz	tuner, 160mHz IF output, 15dB noise figure
WJ-1035	2-4gHz	30mHz	tuner, 160mHz IF, 15db NF
WJ-1036	4-8gHz	35mHz	tuner, 160mHz IF, 20db NF
WJ-1037	8-12gHz	25mHz	tuner, 160mHz IF, 20db NF
WJ-1038	12-18gHz	30mHz	tuner, 160mHz IF, 20db NF
WJ-1091	30-50mHz	300kHz	tuner, 21.4mHz IF output, 6dB noise figure
WJ-1092	50-100mHz	300kHz	tuner, 21.4mHz IF, 7dB NF
WJ-1093	100-170mHz	300kHz	tuner, 21.4mHz IF, 7.5dB NF
WJ-1094	170-250mHz	300kHz	tuner, 21.4mHz IF, 9dB NF
WJ-1095	250-500mHz	300kHz	tuner, 21.4mHz IF, 10dB NF
WJ-1096	500-1000mHz	300kHz	tuner, 60mHz IF, 12dB NF
WJ-8604	20-512mHz		same specs as WJ-8607 except smaller package and quick disconnect connector
WJ-8607	20-512mHz	10/20/50/250kHz/ 4mHz standard (6.4kHz-8mHz available)	miniceptor, AM/FM/CW/Pulse (SSB opt), microprocessor control, 100Hz resolution, HPIL/RS-232 remote interface, scan, step, can be used with WJ-9902 and WJ-9908 equip frames or WJ-9605 and WJ-9607 front panels, 1.5"h x 6.5"w x 10.5d, 5lbs
WJ-8607fe	2-2000mHz		same specs as WJ-8607
WJ-8609A	20-512mHz	0.25-40mHz avail	same specs as WJ-8607 except AM/FM/Pulse only
WJ-8609A-1	0.235-18gHz	5 from 0.25-40mHz (SAW fils)	wideband version of WJ-8609A, uses WJ-9290 block downconverter, AM/FM/ Pulse, RF preselection, 100Hz resolution, scan,

			step, remote control: HPIL, RS-232 or RS-422
WJ-8615D	20-500mHz	10/20/50/100/ 300kHz	AM/FM/CW/USB/LSB/pulse, synthesized, micropro-cessor controlled w/100Hz steps, LED readout, COR, IEEE-488 interface, 1/2 rack width 3.25"h, opts: coverage to 4.5gHz, IF BWs from 3.2kHz to 4mHz
WJ-8615P	20-500mHz	3 std from 3.2kHz -8mHz (5 as opt)	AM/FM/CW/Pulse, SSB opt, microprocessor control, step, scan, lockout, clock, calendar, integral battery backup, logs signal acquisition w/ date & time to RS-232, printer or audio interface, options include tracking preselector, selected audio, wideband outputs, 3.5"h x 8.25"w x 20"d, 25lbs
WJ-8616	20-500mHz		synthesized, 7 digit LED readout
WJ-8617	20-500mHz (0.5-1100 mHz opt, down to 10kHz on special request)	10/20/100/500khz 2mHz	AM/FM/CW/SSB/pulse, synthesized, micropro-cessor controlled w/100Hz steps, 7 digit LED readout, 48 programmable search bands, 96 memory channels, search/scan for user-defined processing or signal acquisition, built-in SDU, master/slave operation of up to 29 receivers, rack mount 5.25" high, 50 lbs Wide variety of options (see 8618 configuration list and 8617/8618 option list)
WJ-8618			EMI hardened version on 8617 Wide variety of options (see 8618 configuration list and 8617/8618 option list)
WJ-8619	20-500mHz	5 BWs, 11 avail from 10kHz-4mHz	AM/FM/CW/Pulse std, SSB & var BFO opt, digital remote controlled by IEEE-488 bus or WJ8617B receiver, 100Hz

			steps, COR, scan module w/X-Y-Z display out
WJ-8619fe	20-1100mHz	as above	same as WJ-8619 except for expanded frequency range
WJ-8625-1	0.2-1.5mHz		AM/FM/CW/USB/LSB, LCD display
WJ-8626A-1			same as A-4 but no front panel, controlled from A-4
WJ-8626A-4	5kHz-30mHz	any 3 from 0.2/ 0.5/1/2/3/4/6/8/ 12/16kHz	AM/FM/CW/USB/LSB, synthesized, micropro-cessor controlled, LCD display, 1/2 rack width 5.25" high
WJ-8628A-1			same as A-4 but no front panel, controlled from A-4
WJ-8628A-4	20-512mHz	four from range of 10khz to 4mHz	AM/FM/CW/SSB/pulse, synthesized, micropro-cessor controlled w/100Hz steps, LCD display, tuned preselection, synth. BFO, 10mS tuning speed, opt: coverage to 1.4gHz, 1/2 rack width 5.25" high
WJ-8640-1	plug-in 0.5-500mHz	10/50/200kHz 5/20kHz optional	AM/FM/CW/USB/LSB, port-able manpack, LED counter w/DAFC, 10 D cell or BA-4386 detachable battery pack or vehicular supply, 4.2"h X 11.4"w X 11.7"d, 18lbs, (mil AN/GRR-8V)
WJ-8650	105-175mHz	5/15kHz	minature receiver, AM/FM, 10 chan, scan, step, tracking preselector, 10-14VDC, 4W, 4.25"dia x 0.6"high, 10oz
WJ-8650-1	200-270mHz	15kHz	same specs as WJ-8650 except 0.8" high
WJ-8652	210-350mHz	100kHz/1/2mHz	minature receiver, AM/FM, 5 chan, scan, step, tracking preselector, 10-14VDC, 2.5W, 0.75"h x 3.25"w x 7.12"d, 1lb
WJ-8653A	400-500mHz or 0.8-1.0gHz	25kHz	minature receiver, FM, scan, step, 10-14VDC, 5W, 0.8"h x 3.5"w x 8.75"d, 1lb

WJ-8654	20-1000mHz	6.4-100kHz	miniceptor, AM/FM/SSB/CW, 100 chan, scan, step, tracking preselector, HPIL &RS-232 remote interface, 9-16VDC, 5W, 1.65"h x 3.0"w x 7.75" d, 2.5lbs
WJ-8700	0.5-32mHz		dual receiver, AM/FM/CW/ USB/LSB, microprocessor control, 8 line by 40 char LCD display, scan, step, lockout, 100 memory channels, suboctave pre-selector, many options, 3.5"h x 8.25"w x 20"d, 18lbs
WJ-8709	5kHz-30mHz	0.3/1/3.2/6/16kHz	AM/FM/CW/MCW/USB/LSB, 7 digit yellow LED display, synthesized: 10Hz steps, 1/2 rack width 5.25" h
WJ-8711	0.005-30mHz	58 digital filters	AM/FM/CW/USB/LSB/ISB/ synchronous AM, fully synthesized, green LED digital readouts, 3 scanning modes, notch filter, bandpass tuning, RS-232 or CSMA remote control, rack mount 5.5" high, 97-253VAC, 47-440Hz, current issue,
WJ-8712	5kHz-30mHz	58 digital filters	remote control version of WJ-8711, half rack 3.5" high, blank front panel, RS-232 or CSMA control
WJ-8718A	5kHz-30mHz	0.3/1/3.2/6/16kHz	AM/FM/CW/ISB/USB/LSB, synthesized, microprocessor controlled w/10Hz steps, 7 digit LED readout (yellow), synthesized BFO, many options notably including /MFP - microprocessor front panel which allows front panel control of scanning and memory, rack mount 5.25" high, 35lbs
WJ-8718A -14			special wideband unit with bandwidths of 40 & 100 kHz
WJ-8718A -15			Special E-Systems unit with green front panel, other

			differences unknown
WJ-8718A -19/FE	5kHz-100mHz	0.3/1/3.2/6/50kHz	AM/FM/CW/ISB/USB/LSB, synthesized, microprocessor controlled w/10Hz steps, MFP - microprocessor front panel which allows front panel control of scanning and memory, built-in remote control, 7 digit LED readout(yellow), synthesized BFO, special DF mode with IF optimized for DF work, many options available, rack mount 5.25" high, 35 lbs
WJ-8721	5kHz-30mHz	digital	VXI card version of WJ-8711, 1/12 rack width, BITE, 5lbs
WJ-8730A	plug-in 20-1000mHz (WJ-9060 series)	plug-in 10kHz-3mHz (WJ-9930 series)	uses two WJ9060 tuning heads (filmstrip dial), solid-state, built-in SDU
WJ-8731A			same specs as WJ8730A except with tuning meter instead of SDU
WJ-8732A			same specs as WJ8730A except only one WJ9060 tuning head
WJ-8733A			same specs as WJ8730A except only one WJ9060 tuning head and tuning meter instead of SDU
WJ-8770	5kHz-20mHz	1/4/8/16kHz std, 0.5/2/6/12kHz opt	AM/FM/CW/LSB/USB, synthesized: 10Hz steps, red LED display, ruggidized, military vehicular radio 22-32VDC, internal AC or battery packs opt
WJ-8809	0.1-18.5gHz	5 from 0.5-40mHz	consists of two units, WJ-8809/RX receiver and WJ-8809/MC microwave converter, AM/FM/Pulse, 100Hz resolution, RF preselection,
WJ-8880	0.5-30mHz	six, opt config	AM/FM/CW/USB/LSB/ISB, synthesized, microprocessor control, rack mount 5.25" high

WJ-8888A	0.5-30mHz	six, opt config	AM/FM/CW/ISB/LSB/USB, synthesized, 10Hz steps, digitally remote controlable, rack mount 5.25" high
WJ-8888B	0.5-30mHz	six, opt config	same as WJ-8888A except improved circuit board design
WJ-8922	1kHz-3gHz		AM/FM/CW/SSB, scans pan/sector or manual, compact unit fits in a suitcase
WJ-8969	0.5-18gHz		70mHz IF, synthesized, 1kHz steps
WJ-8972	20-500mHz		receiver/DF controller, part of WJ8990 system
WJ-9080	30-1000mHz	n/a	converter, tunes all in one band
XT-8012	8-12gHz	8mHz minimum	converter, one 160mHz IF output, two 21.4mHz outputs, 18dB max noise figure, four section YIG preselector, DAFC in, AGC in, LO out, 25lbs, cost $6500 (1968)

Communications Electronics, Inc.
and Watkins Johnson
Receiving Systems Guide

06/03/04

This is an ongoing project. I'm always looking for more information, particularly on the variants denoted by the -x suffixes.
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Model	Description
AN/PRD-11	VHF/UHF radio DF system, 20-512 mHz, consists of WJ8640-1 receiver, WJ8975A DF processor, WJ-9180-1 SDU and WJ9880A antenna
AN/TLQ-504	communications jamming system, military version of WJ-4810
RS-112	microwave Pan-Man receiving system, continuous four band simultaneous scanning of 1-12gHz, components may include: MPP-101 microwave pan preselector, PTM-101 pan tuner module, PS-103 power supply, LIF-107 log IF demod, MC-103 master control, PD-602 pan display, EF-602 equipment frame, PD-102 pan display, PD-201 pan display, MT-112 microwave tuner, DM-112 demod, 112 microwave receiver, SM1622 SDU
RS-125	receiving system, coverage of 10-2000mHz available with four demodulators provide bandwidths ranging from 5kHz to 8mHz, basic system consists of SM-9401A, UT-1000C, VT-30C, SWP-104, DM-4C and S-9901, versatile sytem available in many configurations with no specialized components
RS-158	receiving system, allows simultaneous monitoring of up to 12 channels in 20-80mHz range using 410 series plug-in receivers, basic components include 410 receiver, DRO-270 counter and EF-158 equipment frame containing multicoupler and RF test signal generator
RS-160	Pan-Man receiving system, allows full band or sector scanning (pan/sector and remote with 205-2 or 215 receiver), basic single band configuration consists of 205 receiver, DRO-308 counter and SM-7301 SDU, uses HH-xx, VH-xx and UH-xx series tuning heads for 2-1000gHz coverage, DRX-308 frequency extender required for digital readout of UH- series tuners, TSU-160 tuner switching unit expands capacity to manual selection of up to 7 tuners, CSU-160 tuner switching unit permits sequential scanning (autostep) of up to 7 tuners, TSU-103B is similar to CSU-160 except it can only hold three tuning heads, additional options include VM-101, UM-101 and UM-160 marker generators, FS-101 2-300mHz synthesizer, FS-102 2-1000mHz synthesizer and EF-160 equipment cabinet, later versions of the system include 205-2 receiver which adds pan/sector and remote scanning or 215 receiver which adds TTL digital control and the DRO-335 counter which counts to 1gHz w/o an

extender

RS-168 EMC version of RS-180, other specs unknown

RS-180 receiving system, AM/FM (CW opt), 30-1000mHz with 480 series tuners, components include DRO-280A counter, WJ-9310 multicoupler and EF-180A equipment frame for up to six 480 series rcvrs or EF-182A for up to 12 rcvrs, receivers time share the counter and DAFC functions, all receivers can monitor from a single broadband antenna

TDS-110 carrier demultiplexing system, for microwave telephone signals in the 3.7-4.2gHz, 960 channels in 16 CCITT super-groups, consists of FE-3442 tuner, IFD-210 IF-tape demod, SM-1622 SDU, TFC-101 supergourp converter, TFC-105 super-group converter, TFC-212 basic supergroup converter, TDM-101 basic group demod, TDM-110 basic group demod, PR-101 LNA, ANT-101 antenna, APR-101 antenna/preamp

WJ-1007 microwave collection system, 1-18gHz, surveillance set for detection and categorization emission parameters, computer controlled

WJ-1026 electronically swept receiving system, 1-18gHz, ruggidized and remote controlled (up to 550 feet) for airborne or shipboard applications

WJ-1047 dual channel receiving system, 0.5-12gHz, digitally tuned system designed for airborne DF and ELINT operation

WJ-1088 airborne receiving system, 0.4-17.5gHz, designed for antenna pattern analysis, all data recorded digitally

WJ-1140 modular microwave receiving system, 0.5-18gHz, extremely ruggdized compact system for ECM, ELINT, surveillance, tracking and broadband communications, digitally controlled

WJ-1154 frequency synthesizer, 1-12.4gHz in 1mHz steps, BCD controllable by appropriate WJ receiver

WJ-1920 Multi-parameter distributed processing system, dual reception using wide-band IFM receiver and a narrow-band superhetrodyne receiver design creates high probability of signal intercept, frequency-domain and time-domain processing of signals.

WJ-4810 communications jammer, 2-500mHz, amplifier modules from 20-1000w available, single, multiple and barrage jamming modes, microprocessor controlled.

WJ-8737 receiving system, very similar to WJ-9028

WJ-8940 receiving system, 5kHz-1gHz, (20Hz-18gHz opt), AM/FM/CW and log detection, 17 IF BWS from 200Hz-50mHz (5Hz w/ ELF opt), for EMC, EMI, Tempest and wideband RF ambient signal surveys, similar configuration to newer WJ-9040

WJ-8955 mobile ESM system, signal monitoring and netted direction finding capability over 2-1100mHz range, complete system consists of 3 vehicles, roof mounted DF antenna requires minimal deployment for set-up.

WJ-8965A communications reconnaissance system, rapid detection of HF/VHF/UHF signals, unit will automatically determine line-of-bearing to VHF/UHF target transmitters, housed in transportable shelter or tactical vehicle, complete with antennas and masts.

WJ-8976 three channel DF system, provides azimuth and elevation bearing information for many types of signals, monopulse, continuous and spread-spectrum, consists of three channel slave receiver, digital processor, master tuner and antenna system, basic operation from 20-500mHz, operation from 2mHz to 1.2gHz is also possible.

WJ-8986 correlative vector 3-5 channel DF ssytem, 2-512mHz range, (expandable to 2gHz), 50mHz/sec scan and DF rate, PC/AT design, graphical front panel displays including spectrum FFT, 8.75"h x 19"w x 20"d, 66lbs

WJ-8990 manpack tactical intelligence system (MANTIS), WJ8972 receiver/DF processor and WJ9881 antenna, RF intercept and DF capability over 20-500mHz range, can be expanded for intercept use from 0.5-1200mHz and DF coverage 2-1200mHz, manual or automated control of serach and DF operations, DF accuracy of 2 degrees, RS-232 controllable, 12VDC internal batteries or 24VDC vehicular power (120VAC opt), WJ8972: 6" X 11" X 16", 24lbs, WJ9881 (stowed) 14" X 14" X 35", 29lbs

WJ-8991 manportable correlative vector DF system, consists of WJ-8996 DF processor, WJ-8997 covert/portable DF antenna, handheld controller, and optional handheld antenna for on-the-move operation, 1-1300mHz (2gHz opt), entire system fits into an ALICE pack, 19"h x 22"w x 12"d, 50lbs

WJ-8996 correlative vector DF, 2 or 4 channel, 1-2000mHz, ruggidized, lower power consumption (10w) for covert/field deployment, options include RS-232 or ethernet interface and quick reaction analysis scan (100mHz/sec)

WJ-8999 portable EMC/Tempest test receiver, 1kHz-1gHz coverage (1-12.4gHz opt), AM/FM/CW/Log, operating modes: fixed, scan/plot, scan/monitor, or remote, 18 IF BWs 100Hz-50mHz (100/200mHz opt), optional built-in signal monitor, designed for EMC, wideband ambient RF surveys, signal analysis, 7"h x 16.87"w x 15"d, 42lbs

WJ-9023C wide range receiving system, 30mHz-12.4gHz, high resolution digital tuning, local or remote control, basic ssytem: WJ-9023C/TSU tuner sythesizer unit, WJ-9023C/IFD IF demod, WJ-9023C/DCU digital control unit and WJ-9023C/ICU interface control unit

WJ-9028 receiving system, 20-1000mHz, AM/FM/CW/pulse, consists of

two units, WJ-9028/RU receiving unit and WJ-9028/DU display unit, RU contains four tuners, COR, AFC, DAFC and provisions for up to 3 WJ-9930 IF amp/demod modules (10 BWs), DU contains counter and SDU, complete system is rack mount 5.25" high

WJ-9040B receiving system, 5kHz-23gHz, multipurpose system for RFI/EMI compatibility investigations, wide-band surveillance and narrow-band analysis. Composed of digital control unit (DCU), tune/synthesizer unit (TSU), IF demodulator (IFD) and auxiliary synthesizer unit (ASU), TSUs provide coverage from 5kHz-1gHz (20Hz-23gHz opt), resolution 1Hz across the range, 11 fixed-tuned and varactor-tuned pre-selection bandpass filters, autoranging antenna attenuator, IFDs provide bandwidths ranging from 200Hz-50mHz centered on 100kHz, 21.4mHz & 160mHz, Operator interface consists of 32 key keyboard, tuning wheel, analog controls for audio and IF gain, 256 character LCD alphanumeric display

WJ-9045 modular tactical receiving system, 5kHz-440mHz using a series of receivers, digital control, DF capable

WJ-9088 frequency management system, signal collection, measurement, modulation identification, sorting and management of signals from 10kHz to 1gHz in 10Hz steps, AM/FM/FM phase/CW/OOK/LSB/USB and noise, tuning time of 20-250mS, controlled by PDP-11 computer which can record, sort and edit up to 30,000 signals via color monitor and function keys.

WJ-9103 multichannel digital tuner, consists of up to 8 WJ-9103/DTM digital tuner modules, tunable LOs, equalization signal source, digital controller and support circuitry, 20-500mHz (20-2000mHz w/ extender opt), 2mHz instantaneous bandwidth (4mHz opt), for precision DF, spectral analysis, antenna beamforming, 5.25"h x 19"w x 22"d, 55lbs

WJ-9104 multichannel digital tuner, similar to WJ-9103 except 20-2400mHz range for each channel, 10mHz instantaneous bandwidth, options include LF/HF capability (0-33mHz), programmable IF BWs (4kHz-10mHz), serial/fiber optic data output, ethernet or high-speed serial control interface, 20mHz instantaneous BW

WJ-9195 rapid acquisition spectrum processor (RASP), digitally refreshed display unit, controls a specially configured WJ-8618B-2 or WJ-8618B-15 receiver for extremely fast display of radio spectrum. Will not operate properly with any other WJ-8618B receivers. Rack mount 8.75" high.

WJ-9195C rapid acquisition spectrum processor (RASP), broadband receiver and spectrum display device, 20-512mHz (expandable 2mHz to 4gHz), 1gHz per second scan rate (!!!), 5 or 25kHz resolution, electroluminescent display, six programmable traces, manual or remote computer control, Can act as a system controller for up to 15 WJ904 receivers, rack mount 8.75" high, 89lbs.

WJ-32320 ELINT/ESM system, 0.5-18gHz, tells you everything you want

to know about every kind of emitter in the area including its location as determined by triangulation and GPS. Not for mere mortals.

Communications Electronics, Inc.
and Watkins Johnson
Accessories and Components Guide

06/03/04

This is an ongoing project. I'm always looking for more information, particularly on the variants denoted by the -x suffixes.
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Model	Description
481A	plug-in receiver, 30-60mHz, AM/FM (CW opt), requires ext power from EF-180A or EF-182A equipment frame, component of RS-180 receiving system
482A	same as 481A except 60-120mHz
483A	same as 481A except 100-180mHz
484A	same as 481A except 180-300mHz
485A	same as 481A except 30-90mHz
486A	same as 481A except 80-250mHz
487A	same as 481A except 20-80mHz
488A	same as 481A except 220-440mHz
489A	same as 481A except 250-500mHz
490A	same as 481A except 500-1000mHz
AGC-BC	Box car AGC unit, plugs into DM-4
AGC-PS	Pulse stretching AGC, plugs into DM-4
ANT-101	antenna, 3.7-4.2gHz, 12dB gain, 25 degree beamwidth, component of TDS-100 system
APR-101	antenna/preamplifier, ANT-101 and PR-101 in single unit
AR7-15	antenna, log-periodic, 1-12.4gHz, 8dB gain, 15dB F-to-B
AR7-17	antenna, log-periodic, 0.5-12.4gHz, 8dB gain, 15dB F-to-B
AR12-18	antenna, log-periodic, 30-1100mHz, 8dB gain, 20dB F-to-B
AR12-19	antenna, log-periodic, 90-1100mHz, 8dB gain, 20dB F-to-B
AR12-20	antenna, log-periodic, 250-1100mHz, 8dB gain, 20dB F-to-B
AR12-22	antenna, log-periodic, 30-160mHz, 8dB gain, 20dB F-to-B

AR12-25	antenna, log-periodic, 30-76mHz, 8dB gain, 20dB F-to-B
AR12-29	antenna, log-periodic, 30-300mHz, 8dB gain, 20dB F-to-B
AR19-5	antenna, omnidirectional conical spiral, 1-11gHz, no gain, 5w power handling
AR19-6	antenna, omnidirectional conical spiral, 7-11gHz, no gain, 5w power handling
AR19-8	antenna, omnidirectional conical spiral, 150mHz-2gHz, no gain, 5w power handling
AR19-9	antenna, omnidirectional conical spiral, 0.2-1.4gHz, no gain, 5w power handling
AR19-10	antenna, omnidirectional conical spiral, 0.25-1.1gHz, no gain, 5w power handling
AR19-11	antenna, omnidirectional conical spiral, 0.3-1.3gHz, no gain, 5w power handling
AR23-4	antenna, loop, 2-30mHz, bi-directional figure eight
AR72-4	antenna, loop, 30-160mHz, bi-directional figure eight
AR122-1	antenna, compacted log-periodic, 150mHz-1gHz, 4.3dB gain, 10w power handling
AR132-1	antenna, compacted log-periodic, 20-300mHz, 5dB gain, 1kw power handling
AR272-1	antenna, dual polarization log-periodic, 1-4gHz, 8dB gain, 20dB F-to-B, 10w power handling
AR274-1	antenna, dual polarization log-periodic, 30mHz-1gHz, 8dB gain, 20dB F-to-B, 25w power handling
AR274-2	antenna, dual polarization log-periodic, 30-300mHz, 8dB gain, 20dB F-to-B, 25w power handling
AR274-3	antenna, dual polarization log-periodic, 250mHz-1gHz, 8dB gain, 20dB F-to-B, 25w power handling
CSU-160	tuner switching unit, works with 205, 205-2 or 215 Pan-Man receivers, manual or sequential scan of tuners, holds up to 7 tuners, part of RS-160, see RS-160 for details
DA-1	video distribution amplifier, 91ohms or high impedance, 1.5vrms out, 6 video, 1 oscilloscope & 2 audio out, 91bs, cost $1200 (1964)
DA-5	audio distribution amplifier, 10kohm in, 150/600ohm out, 150Hz-10kHz response, five outputs, cost $595 (1966)
DM-4	demodulator, 21.4mHz input, accepts 4 plug-ins, 6mHz bandwidth, BFO, squelch, tuning and signal strength meters, 3 audio outputs: 100mw into 600ohm, built-in

	speaker, 3 video outputs: analysis, recorder & tracking
DM-22A	demodulator, 21.4mHz input, AM only, BW=1.5mHz
DM-112	demodulator, 160mHz input, 100kHz/2/4/10/20mHz BWs, AM/FM/ pulse, built in SDU, AFC and AGC outputs (to tuner), carrier and center-tune meters, typically paired with MT-112
DM-160	demodulator, 160mHz input, AM/FM/pulse, BW=0.35/1.5/4mHz
DM-161	demodulator, 160mHz input, AM/FM/pulse, BW=1/5/10/20mHz
DM-212	demodulator, 160mHz input, AM/FM/pulse, BW=10/20 mHz
DM-235	demodulator, 160mHz input, BW=30/50 mHz
DMS-105	tunable demodulator, 1-1600kHz, 5 digit Nixie readout, AM/FM/SSB/CW/MCW/FSK, IF BWs in two ranges: SSB - 2.4/ 3.5/4/8kHz; other modes - 0.15/1/5/7/8/16kHz, DAFC, rack mount 5.25" high
DMS-105A	same as DMS-105 except SSB BWs= 2.4/4/8kHz and has translated IF predetection outputs at 15/50/100kHz
DMS-105R	EMC version of DMS-105A, also has predetection IF outputs of 10/50/100kHz
DMS-107	tunable demodulator, 0.1-10mHz, filmstrip dial, IF BWs: 20/50/100/300/500kHz/1/2/3mHz, DAFC w/DRO-302 or DRO-320, carrier and center tune meters
DMS-107-1	same as DMS-107 except BW= 20/50/100/300/500kHz/1/3/5.5mHz
DMS-109	tunable demodulator, 5kHz-1mHz, 5 digit Nixie display, USB/LSB, BW=2.8kHz, DAFC
DMS-201	tunable demodulator, 0.5-10mHz, CW/FSK, BW=1/3kHz
DRO-50	digital frequency display, 0.54-54mHz, for use with 455kHz IF receivers, 6 digit Nixie display, included kit for modifying SP-600, cost $2500 (1967) (variants were available for 500kHz, 3.9mHz and 21.4mHz IFs)
DRO-270	digital frequncy display, 20-80mHz, for use with 10mHz IF receivers, 5 digit Nixie readout, DAFC for up to twelve receivers, part of RS-158 receiving system, rack mount 1.75" high
DRO-280A	digital frequency display, 20-1000mHz, 6 digit LED display, DAFC, provides control of 12 receivers in 15 msec intervals, 12 position switch for selecting receiver whose frequency is to displayed, part of RS-180 receiving system
DRO-290	digital frequency display, 20-90mHz, for use with 10mHz IF receivers like CEI 519 and 521A, DAFC, 6 digit Nixie display, rack mount 1.75" high, 10lbs, cost $3100

(1967)

DRO-290B similar to DRO-290 except with LED display

DRO-300 digital frequency display, 30-300mHz, for use with 21.4mHz IF receivers, 6 digit Nixie display, variants avail for 455/500kHz and 3.9mHz IFs, cost $2800 (1967)

DRO-302A digital frequency display, 30-300mHz, for use with 21.4mHz IF receivers, 6 digit Nixie display, DAFC output, 1/2 rack width, cost $3200 (1968)

DRO-302A-2 digital frequency counter, same specs as DRO-302A except with BCD outputs

DRO-302B digital frequency display, 0.1-500mHz, 6 digit LED readout, 21.4 & 60mHz IF presets (modifiable to any IF preset in increments of 0.1 mHz), solid-state, DAFC, half rack width (have manual)

DRO-307 digital frequency display, 30-300mHz, 6 digit Nixie readout, 21.4mHz IF preset, DAFC control of four rcvrs w/ last two digits independently selectable for each rcvr, BCD outputs for all four receivers

DRO-307-1 digital frequency display, 0.5-30mHz, 65mHz IF preset, otherwise similar to DRO-307, used w/232 tunable filters

DRO-308 digital frequency display, 2-300mHz, 21.4mHz offset, 6 digit Nixie display, DAFC, component of RS-160 Pan-Man receiving system, mounts in SM-7301 frame 5.25" high

DRO-309A digital frequency display, 0.1-1060mHz, same specs as DRO-302B (have manual)

DRO-309B same specs as 309A, newer IC counter circuitry

DRO-310 digital frequency display, 0.1-300mHz (4gHz w/plug-in mixers), 6 digit, 21.4mHz presets, multiple inputs, (mil CP-943/GLA-21), has accessory slot for mixers, SDU, ACL tuning heads.

DRO-311 digital frequency display, 20-500mHz, automatic IF offset when used with 565 or WJ-8730 series, time-shares control of four receivers, drives up to four RD-105 remote displays

DRO-312 digital frequency display, 0.01-1000mHz

DRO-315 digital frequency display, 0.1-500mHz, identical to DRO-302B except full rack width, 1-3/4" high (have manual)

DRO-333 digital frequency display, 0.1-1060mHz, identical to DRO-309A except full rack width, 1-3/4" high (have manual)

DRO-333A same as DRO-333 except with ICs instead of discrete components in the counter section

DRX-308	frequency extender for DRO-308, 300-1000mHz, rack mount 1.75" high
DRX-1000	frequency extender for DRO-300 and DRO-302 counters, 235-1000mHz, also extends DAFC operation, half rack width
DTF-101	test module for DM-4 demodulator, test DM-4 by plugging into any of the four module slots, cost $225 (1965)
EC-101	extender cable for DM-4 module, allows for testing of IFD units outside of DM-4, cost $150 (1965)
EF-101	equipment frame, single unit rack mount for 1/2 rack width units with front panels 3.25"h X 8.0"w
EF-158	equipment frame for RS-158 receiving system, contains an RF multicoupler for 12 receivers w/ 50 ohm and 5dB max noise figure and an RF test signal generator
EF-160	cabinet for RS-160 Pan-Man receiving system
EF-201	equipment frame, dual unit rack mount for 1/2 rack width units with front panels 3.25"h X 8.0"w
EF-301	equipment frame, single unit rack mount for 1/3 rack width units with front panels 5.0"h X 4.5"w
EF-302	equipment frame, dual unit rack mount for 1/3 rack width units with front panels 5.0"h X 4.5"w
EF-303	equipment frame, triple unit rack mount for 1/3 rack width units with front panels 5.0"h X 4.5"w
EF-401	equipment frame, single unit rack mount for 1/4 rack width units with front panels 6.75"h X 3.75"w
EF-402	equipment frame, dual unit rack mount for 1/4 rack width units with front panels 6.75"h X 3.75"w
EF-403	equipment frame, triple unit rack mount for 1/4 rack width units with front panels 6.75"h X 3.75"w
EF-404	equipment frame, quad unit rack mount for 1/4 rack width units with front panels 6.75"h X 3.75"w
EF-501	equipment frame, single unit rack mount for 1/5 rack width units with front panels 5.0"h X 3.0"w
EF-502	equipment frame, dual unit rack mount for 1/5 rack width units with front panels 5.0"h X 3.0"w
EF-503	equipment frame, triple unit rack mount for 1/5 rack width units with front panels 5.0"h X 3.0"w
EF-504	equipment frame, quad unit rack mount for 1/5 rack width units with front panels 5.0"h X 3.0"w
EF-505	equipment frame, five unit rack mount for 1/5 rack

	width units with front panels 5.0"h X 3.0"w
EF-506B	equipment frame, rack mount for 440 series receivers
EF-602	equipment frame for RS-112 receiving system
FC-103	3 ch. xtal controlled converter
FT-101A	IF to tape converter, 21.4mHz input, 750kHz center output, 6lbs
FT-201A	half rack unit of FT-101A
FT-207	wideband IF to tape converter, 21.4mHz input, 2.15mHz center output, 300kHz or 4mHz BW output to recorder
FT-210	IF-tape converter, 21.4mHz input, 1.075mHz output, data bandwidth of 150kHz-2mHz, half rack width
FT-210E	same as FT-210 except has equalizer for min group delay
FT-222	narrowband IF to tape converter, 21.4mHz input, 20 or 200kHz center frequency output, 500kHz BW
FT-4557	frequency translator, 455kHz input, staggers the IF outputs of up to six receivers between 580Khz and 1330kHz, 50kHz BW, cost $2900 (1965)
HFM-8	antenna multicoupler, 2-30mHz, 75ohm impedance, 8 outputs, 10dB maximum noise figure, 8dB gain, quick change connector outputs on rear (like RCA video patch bays), 8lbs, cost $400 (1964)
HFM-8-1	same specs as HFM-8 except connectors on front panel
HFM-8-2	same specs as HFM-8 except BNC on front panel
HFM-8-3	same specs as HFM-8 except BNC on rear panel
HH-11	tuning head, 2-30mHz, for use with 205 series and 215 Pan-Man receivers, low intermod design, dual conversion, 67.8 and 21.4mHz IFs, max noise figure 15dB
HH-11-1	tuning head, 0.9-30mHz, otherwise identical to HH-11
HPF-2	high pass filter accessory for HPM-8 series, attenuates below 2mHz
IFC-162	frequency converter, 160mHz IF input, 21.4mHz output
IFD4-300	dual wideband 21.4mHz IF demodulators
IFD-5	demodulator plug-in for DM-4, AM/FM/CW, 5kHz bandwidth
IFD-15	demodulator plug-in for DM-4, AM/FM/CW, 15kHz bandwidth
IFD-50	demodulator plug-in for DM-4, AM/FM/CW, 50kHz bandwidth

IFD-100	demodulator plug-in for DM-4, AM/FM/CW, 100kHz bandwidth
IFD-103	demodulator, 21.4mHz input, BW=10/50/100/300mHz, provides AM and FM output and predetection IF output for recording
IFD-200	demodulator plug-in for DM-4, AM/FM/CW, 200kHz bandwidth
IFD-201	demodulator, 21.4mHz input, BW=10/50/300/1000kHz, provides AM and FM output and predetection IF output for recording, half rack width
IFD-210	demodulator, 160mHz input, FM, BW=10/22mHz (8.5mHz video), component of TDS-100 system
IFD-500	demodulator plug-in for DM-4, AM/FM/CW, 500kHz bandwidth
IFD-1000	demodulator plug-in for DM-4, AM/FM/CW, 1mHz bandwidth
IFD-2000	demodulator plug-in for DM-4, AM/FM/CW, 2mHz bandwidth
IFD-4000	demodulator plug-in for DM-4, AM/FM/CW, 4mHz bandwidth
IFD-8000	demodulator plug-in for DM-4, AM/FM/CW, 8mHz bandwidth
LIF-107	Log IF demodulator, component of RS-112 receiving system
MC-103	master control, component of RS-112 receiving system
MD-50	autoscan motor tuning drive, adapts single tuner units to automatic tuning
MD-100	same specs as MD-50 except designed for dual tuner units
MD-104	same specs as MD-50 except designed for four tuner RS-111
MTF-100A	microwave tuner frame, accepts two TH- series tuning heads, 160 and 21.4mHz outputs, AFC, AGC and DAFC inputs
MTF-101	microwave tuner frame, slave to MTF-100A, adds space for two additional TH- series tuning heads
MTF-102A	microwave tuner frame, accepts one TH- series tuning head, 160 and 21.4mHz outputs, AFC, AGC and DAFC inputs
MP-101	carrier level meter panel, read peak or average, 21.4mHz IF input, contains IF strip and AM detector
MP-102	deviation and tuning meter panel, 21.4mHz IF input, contains IF strip and FM detector
MPP-101	microwave pan preselector, contains four YIG preselectors for each of 1-2/2-4/8/8-12gHz, requires PS-103, component of RS-112 receiving system
NS-101	noise silencer demodulator plug-in for DM-4, AM/CW, 2mHz pre-ANL BW, 15kHz overall BW, 2.75lbs, cost $800 (1965)

PEC-401	portable equipment case, holds one 440 or 441 receiver, battery operation w/ built-in nicad charger, built-in speaker and whip antenna
PR-101	preamplifier, 23dB gain, 4.5dB noise figure, component of TDS-100 system
PS-103	power supply, component of RS-112 receiving system
PTM-101	pan tuner module, contains mixers, LO and IF preamps, component of RS-112 receiving system
RD-105	remote frequency display, for use with DRO-311
S-9203A	speaker panel, half rack version of S-9903D
S-9901A	speaker panel, 2.5"x10" speaker, 600ohm, headphone jack, cost $75 (1965)
S-9902A	same as S-9901A except with 7 input selector switch cost $100 (1965)
S-9903D	amplified speaker panel, 2.5"x10" speaker, 5 watt audio amp, 10k input impedance, 7 input selector switch, headphone jack, cost $160 (1965)
S-9908B	same specs as S-9903D except with eighth input position for microphone and BNC monitor output, cost $225 (1965)
SFM-1	standard frequency multiplier, 1mHz standard input, 50/100/500/1000mHz output, 1vrms output
SOR-1A	signal operated relay, controls up to two devices with contact closure on voice, positive-going or negative-going DC, self-contained 6"w X 3.5"h X 7.75"d
SP-101	storage panel for modules used with DM-4, cost $125 (1965)
SWP-101	RF/IF switch panel, 3 inputs, 4 outputs, used in RS-125
SWP-104	RF/IF switch panel, 4 inputs, 4 outputs, used in RS-125
SWP-602	IF switch panel, 6 position, used with SDU to monitor several receivers, 1/2 rack width unit
TDM-101	demodulator, 60-108kHz, SSB, twelve outputs 300-3500Hz, component of TDS-100
TDM-102	demodulator, 12-60kHz, SSB, twelve outputs 300-3500Hz, component of TDS-100
TDM-110	demodulator, ten 60-108kHz inputs, SSB, ten outputs 300-3500Hz, component of TDS-100
TF-101	Tape to IF converter, converts tape recorder output centered at 750kHz into standard 21.4mHz
TF-102	similar to TF-101 except with adjustable output freq

TF-103	tape to IF converter, converts video signals in 40kHz to 4mHz range to 21.4mHz IF output, companion to IFD-103
TF-201	half rack unit of TF-101
TF-202	half rack version of TF-102
TF-210	tape to IF converter, 1.075mHz input center frequency, 21.4mHz output, digital thumbwheel frequency control
TFC-101	converter, 60kHz-4mHz input, twelve outputs in 312-552kHz range (CCITT supergroups 1-10), component of TDS-100 system
TFC-105	converter, 2548-4028kHz input, six outputs in 312-552kHz range (CCITT supergroups 11-16), component of TDS-100 system
TFC-212	converter, 312-552kHz input, five 60-108kHz outputs, component of TDS-100 system
TH-120	1-2gHz drop-in tuner for 112 receiver and MTF-series microwave tuning frames, filmstrip dial, 11dB max noise figure, four section YIG preselector, 160mHz IF out, BW=22mHz @ -3dB, 3.15"h x 7.75"w x 14.9"d, 8lbs
TH-120R-5	wideband version of TH-120, 50mHz @ -3dB, otherwise same
TH-145R	1-4.5gHz, 16dB noise figure, 4 digit LED readout, electronically tuned, otherwise same as TH-120
TH-240	2-4gHz, 18dB max noise figure, otherwise same as TH-120
TH-245	2-4.5gHz, 20dB max noise figure, otherwise same as TH-120
TH-245R-5	wideband version of TH-245, 50mHz @ -3dB, otherwise same
TH-480	4-8gHz, otherwise same as TH-240
TH-480R-5	wideband version of TH-480, 50mHz @ -3dB, otherwise same
TH-812	8-12gHz, otherwise same as TH-240
TH-812R-5	wideband version of TH-812, 50mHz @ -3dB, otherwise same
TH-1218R	12-18gHz, BW=50mHz @ -3dB, otherwise same as TH-240
TSU-103B	tuner switching unit, works with 205, 205-2 or 215 Pan-Man receivers, manual selection of tuners, holds up to 3 tuners, part of RS-160, see RS-160 for details
TSU-160	tuner switching unit, works with 205, 205-2 or 215 Pan-Man receivers, manual selection of tuners, holds up to 7 tuners, part of RS-160, see RS-160 for details
UH-11	plug-in tuner, 250-500mHz, for 205, 205-2 or 215 receivers
UH-12	plug-in tuner, 0.5-1gHz, for 205, 205-2 or 215 receivers

UH-13 plug-in tuner, 220-440mHz, for 205, 205-2 or 215 receivers

UH-101 plug-in tuner for 565 series receivers, 235-500mHz

UH-102 plug-in tuner for 565 series receivers, 500-1000mHz

UH-104 plug-in tuner for 565 series receivers, 490-1000mHz

VDA-4 video distribution amplifier, four outputs, up to 20dB gain, meters four each output, 75ohm impedance, 1.5mHz bandwidth

VH-11 plug-in tuner, 30-60mHz, for 205, 205-2 or 215 receivers

VH-12 plug-in tuner, 60-120mHz, for 205, 205-2 or 215 receivers

VH-13 plug-in tuner, 100-180mHz, for 205, 205-2 or 215 receivers

VH-14 plug-in tuner, 180-300mHz, for 205, 205-2 or 215 receivers

VH-15 plug-in tuner, 20-40mHz, for 205, 205-2 or 215 receivers

VH-16 plug-in tuner, 40-80mHz, for 205, 205-2 or 215 receivers

VH-17 plug-in tuner, 50-100mHz, for 205, 205-2 or 215 receivers

VH-101 plug-in tuner for 565 series receivers, 20-90mHz

VH-103 plug-in tuner for 565 series receivers, 90-260mHz

VH-105 plug-in tuner for 565 series receivers, 200-425mHz

VH-107 plug-in tuner for 565 series receivers, 100-400mHz

VOR-1A voice operated relay, single channel unit, half rack

VOR-2 voice operated relay, twelve channel unit, audio or COR detection, recorder interface for end of tape indication, rack mount 5.25" high, modular

VOR-6 voice operated relay, 6 channel unit, individual delay and threshold controls, 20lbs, cost $815 (1964)

WJ-1234 System interface unit, multi-functional, microprocessor-based operator/receiver interface, flexible command structure, 48 programmable scan strategies, 3000 emitter mode library file, 500mHz instantaneous bandwidth display.

WJ-8610A-1 Multiple receiver system control hub, up to 14 receivers and a variety of surveillance equipment, software programmable, can be remote controlled by computer

WJ-8610A-5 Similar to WJ-8610A-1 but adds ability to control tape recorders and other equipment

WJ-8610A-7 Similar to WJ-8610A-1 but designed to control demodulators like the WJ-9477 instead of receivers

WJ-8610A-10 Differences from WJ-8610A-1 unknown

WJ-8971A DF processor, interfaces with 21.4mHz wideband IF output, usable with receivers from 20mHz to 1gHz, pseudo-doppler operation using synchronised antenna commutation and signal handling circuitry, LED compass rosette and three digit LED bearing readout, IEEE-488 controllable, 3 degree accuracy, selectable integration times, requires special antenna: WJ-9872A, WJ-9880(-1), WJ-9871A or WJ-9873, rack mount 5.25" high

WJ-8971A mobile DF antenna for use with WJ-8971A or WJ-8975A, 20-235mHz and 150-1000mHz

WJ-8971A-5 DF processor, same as WJ-8971A except with multiple IF BWs, bearing offset correction and remote control of IF BWs and integration times

WJ-8971A-6 DF processor, same as WJ-8971A-5 except all functions are remote controllable through an IEEE-488 interface

WJ-8971A-7 DF processor, same as WJ-8971A except with IEEE-488 remote control interface

WJ-8971/AS DF antenna simulator, for alignment of WJ-8971A system

WJ-8972A fixed site DF antenna for use with WJ-8971A or WJ-8975A, 20-150mHz and 150-1000mHz

WJ-8973 ruggidized DF antenna for use with WJ-8971A or WJ-8975A, 20-235mHz and 150-1000mHz

WJ-8975A manpack DF processor, line of bearing information for signals in the 20-500mHz range, LED compass rosette and three digit LED bearing readout, battery powered (internal 10 D cell or magnesium BA-4386 pack) or vehicular supply, used with WJ8640-1 receiver, (mil C-11495/PRD-11)

WJ-8986/AU-3 DF antenna system, consists of 3,4 or 5 vertically polarized 15' monopoles spaced 14' apart, 2-30mHz, can be used with WJ-8986 with WJ-8986/AAU-1 option

WJ-8986/AU-5 triple interferometer DF antenna bay, 20-1200mHz, ruggedized, 12.7'h, 75lbs

WJ-8992 UHF psuedo doppler DF antenna, 500-1000mHz, used w/WJ-8990

WJ-9061 tuning head, drop-in, 20-90mHz, used in WJ-8730 series

WJ-9062 tuning head, drop-in, 90-300mHz, used in WJ-8730 series

WJ-9063 tuning head, drop-in, 200-425mHz, used in WJ-8730 series

WJ-9064 tuning head, drop-in, 250-500mHz, used in WJ-8730 series

WJ-9066 tuning head, drop-in, 30-90mHz, used in WJ-8730 series

WJ-9068 tuning head, drop-in, 490-1000mHz, used in WJ-8730 series

WJ-9150 tuner series, five units covering 1-18gHz, for use with the WJ-9450 demodulator/control unit

WJ-9203A speaker panel, 7 audio inputs, high-Z in, 5W output, half rack 3.5" high

WJ-9222 1.75" high version of FT-210

WJ-9222E 1.75" high version of FT-210E

WJ-9230 upconverter/demodulator for WJ-8640 (GRR-8), converts 0.5-30 MHz to 100.5-130 MHz, built into extra tall cover for the receiver

WJ-9240 1.75" high version of IFC-162

WJ-9290 microwave block downconverter, extends WJ-8609A-1 miniceptor to microwave range, tailored to specific communication bands, 10-14VDC, 4W, 0.75"h x 3.5"w x 6.0"d, 15oz

WJ-9310 antenna multicoupler, twelve outputs, 20-1000mHz, 2dB gain, noise figure: 6.5dB (20-300mHz; 8.5dB (300-1000mHz), used in RS-180 system

WJ-9311 antenna multicoupler, twelve outputs, 0.5-30mHz, 2dB gain, max noise figure 7dB

WJ-9314 antenna multicoupler, four outputs, 20-1100mHz

WJ-9315 antenna multicoupler, twelve outputs, 20-1100mHz, multiple antenna inputs

WJ-9395 tunable demod, 1-900kHz, AM/FM/SSB, five digit LED readout, DAFC, BWs: 2/4/8/16kHz (AM/FM); 1/2/4/6kHz (USB/LSB), portable packaging 10"w x 12"d x 4"h

WJ-9424 voice grade channel demodulator, up to 30 demods in single half rack case, demodulates VFT, modem & FAX voice grade signals, upgradeable through firmware, 3.5"h x 8.25"w x 22"d, 20lbs

WJ-9450 demodulator/control unit, 160mHz IF input, AM/FM/pulse, 5 digit LED frequency display, 3 independent IFDs w/ 6 BWs per IFD, AFC, works with WJ-9150 series tuners

WJ-9470 FSK/OOK demod system, handoff version of WJ-9472

WJ-9471 VFT FSK demodulator system, up to 24 independent demods, 200Hz-9.999kHz, phase-locked-loop demodulation, built-in diversity operation

WJ-9472 two channel FSK demodulator system, FSK or OOK, digital control to 1Hz of mark and space frequencies from 200-9999 kHz, multipole matched baud rate filters for 10-4000 baud

WJ-9477 precision tunable demodulator, AM/FM/SSB, 0.001-30mHz, 10Hz steps, provision for 9 BW filters (3kHz to 5Mhz), microprocessor controlled

WJ-9477G tunable demodulator, AM/FM (SSB opt), 0-31mHz, 10Hz steps, provision for 9 BW filters (3.2kHz-6mHz), microprocessor controlled, 3.5"h x 8.5"w x 21"d, 20lbs

WJ-9480 tunable demodulator system, consists of 2 units; tuner/IF amp and demod, 0.1-30mHz, 100Hz steps, simultaneous AM/FM/PM detection, 13 IF BWs (3kHz-20mHz), IEEE-488 remote, 21.4 & 160mHz inputs, 21.4/70/160mHz outputs, each section is 5.25"h x 19"w x 22"d, tuner: 44lbs, demod: 54lbs

WJ-9497 tunable demodulator, 0-90mHz or 160mHz IF, 1Hz steps, AM/FM/SSB, programmable bandwidth from 100Hz-20mHz, BITE, 3.5"h x 8.5"w x 21"d, 20lbs

WJ-9518A FDM demodulator, six independent SSB demodulators tunable from 0-15mHz, local or IEEE-488 control, preprogrammed tuning for standard CCITT 960 or 2700 channels, scanning available in increments of 1kHz to 1mHz or discrete frequency tuning. Single control and readout for all six tuners. Rack mount 3U high (5-1/4")

WJ-9518AE same as WJ-9518A except with delay equalized demodulators

WJ-9518B FDM demodulator, six independent SSB demodulators tunable from 0-15mHz, local or IEEE-488 control, preprogrammed tuning for standard CCITT 960 or 2700 channels, scanning available in increments of 1kHz to 1mHz or discrete frequency tuning. Individual control and readout for each tuner. Rack mount 2U high (3-1/2")

WJ-9525 FDM demodulator, consists of four /DU demodulator units, one /CU control unit and one /CRF controller rack frame

WJ-9548 digital FDM demultiplexer, up to 24 tunable FDM channel demods in a single half rack case, channels tune 0-20mHz in 1Hz steps, 4 analog baseband inputs, 8 line by 40 char LCD display, 3.5"h x 8.25"w x 20"d, 20lbs

WJ-9605 receiver front panel, provides local control for 1 or 2 WJ-8607 miniceptors, or remote control of WJ-8700 receiver, 3.5"h x 8.3"w x 3.1"d, 2.2lbs

WJ-9607 multi-receiver front panel, provides for local control of up to 29 HPIL interfaced WJ-8607s, WJ-8609s or WJ-8809s, 3.5"h x 8.3"w x 4.4"d, 3.0lbs

WJ-9644A receiver controller, can operate up to 32 WJ-8718 receivers through RS-232 interface

WJ-9773-1 voice operated relay, two channels, rack mount 1.75" high

WJ-9773-2 voice operated relay, four channels, rack mount 1.75" high

WJ-9880 DF antenna, manpack, for use with WJ-8971A or WJ-8975A,

20-175mHz

WJ-9880-1 DF antenna, manpack, for use with WJ-8971A or WJ-8975A, 20-175mHz and 150-850mHz

WJ-9881 DF antenna, 20-512mHz, used w/WJ-8990 system

WJ-9886-1 DF antenna, 20-1000mHz, 2 bays of vertically polarized elements, used w/WJ-8986 system

WJ-9886-1A DF antenna, 20-2000mHz, 3 bays of vertically polarized elements, used w/WJ-8986 system

WJ-9886-2 DF antenna, 20-1200mHz, similar to WJ-9886-1 except in a smaller package, used w/WJ-8986 system

WJ-9902 equipment frame, houses 1 or 2 WJ-8706 or WJ-8609A miniceptors, intergral AC supply, optional host interface, can be fitted with WJ-9605 front panel, 3.5"h x 8.5"w x 20"d, 10lbs

WJ-9903E speaker panel, 7 audio inputs, high-Z in, 5W output, full rack 3.5" high

WJ-9908 equipment frame, houses up to 8 WJ-8706 or 8709A miniceptors, integral AC supply, optional host interface, 8.75"h x 19"w x 21"d, 20lbs

WJ-9930-10 IF amplifier w/ 10kHz BW and limiter discriminator, used in WJ-9028, WJ-8730 series and 565A

WJ-9930-20 same as WJ-9930-10 except 20kHz BW

WJ-9930-50 same as WJ-9930-10 except 50kHz BW

WJ-9930-100 same as WJ-9930-10 except 100kHz BW

WJ-9930-200 same as WJ-9930-10 except 200kHz BW

WJ-9930-300 same as WJ-9930-10 except 300kHz BW

WJ-9930-500 same as WJ-9930-10 except 500kHz BW

WJ-9930-1M same as WJ-9930-10 except 1mHz BW

WJ-9930-2M same as WJ-9930-10 except 2mHz BW

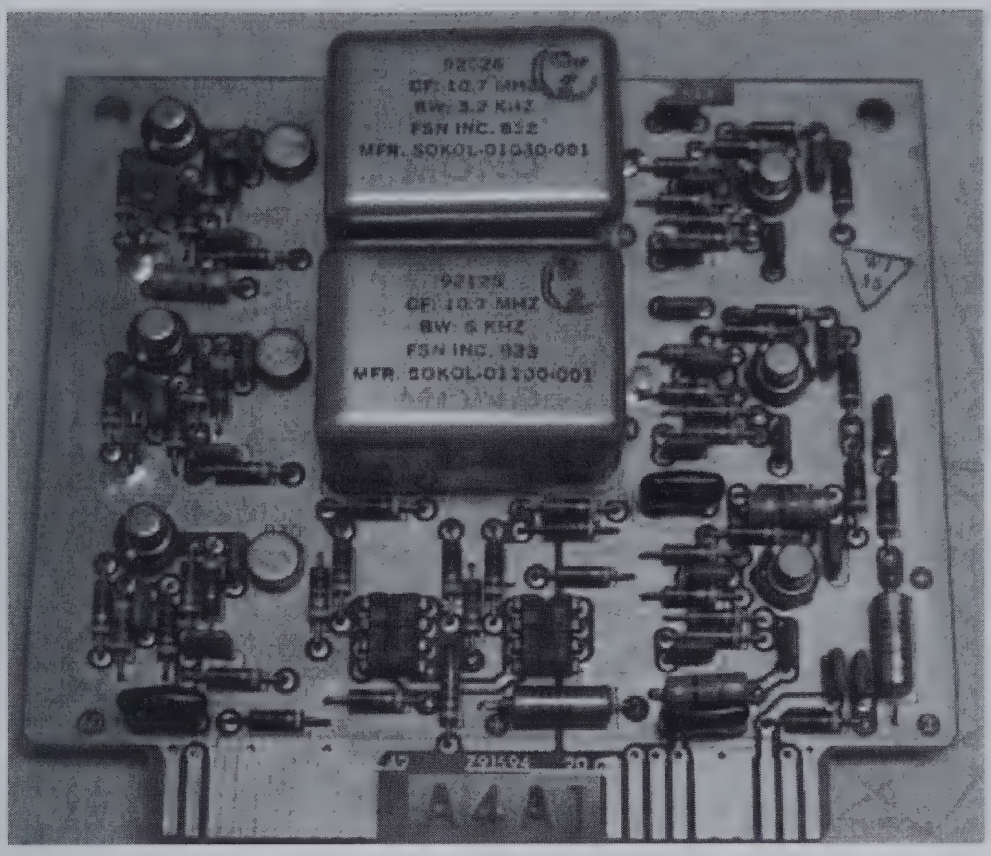
WJ-9930-3M same as WJ-9930-10 except 3mHz BW

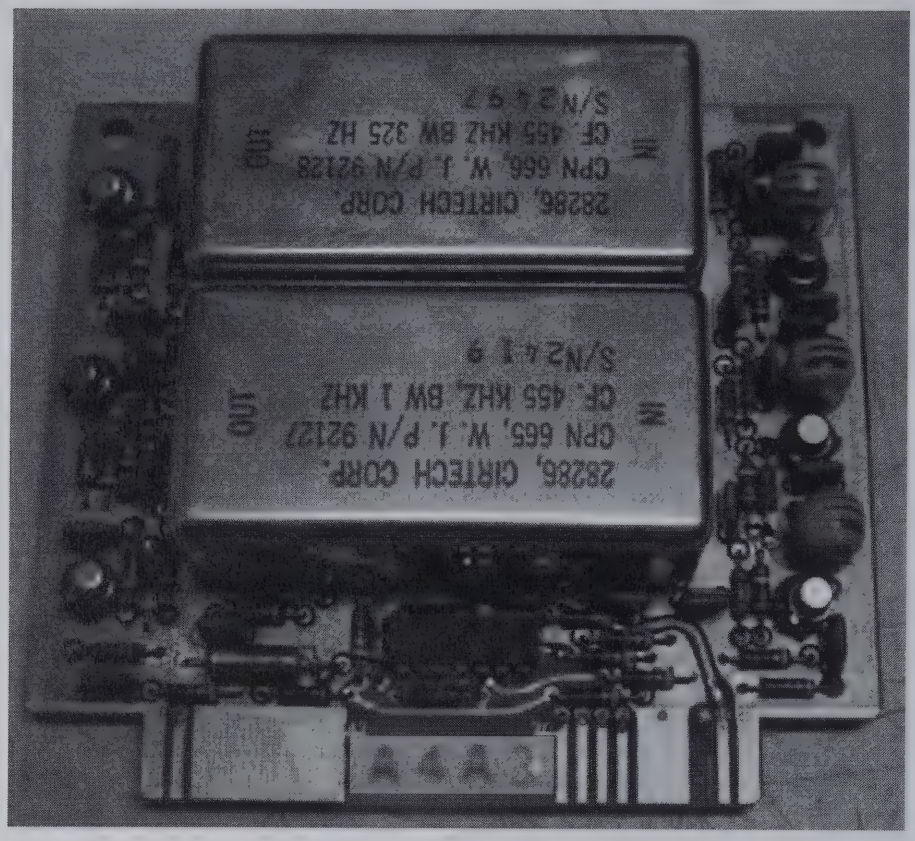
WJ-9948 blower module, for cooling a rack, 3,6 or 9 blowers, rack mount 1.75" high

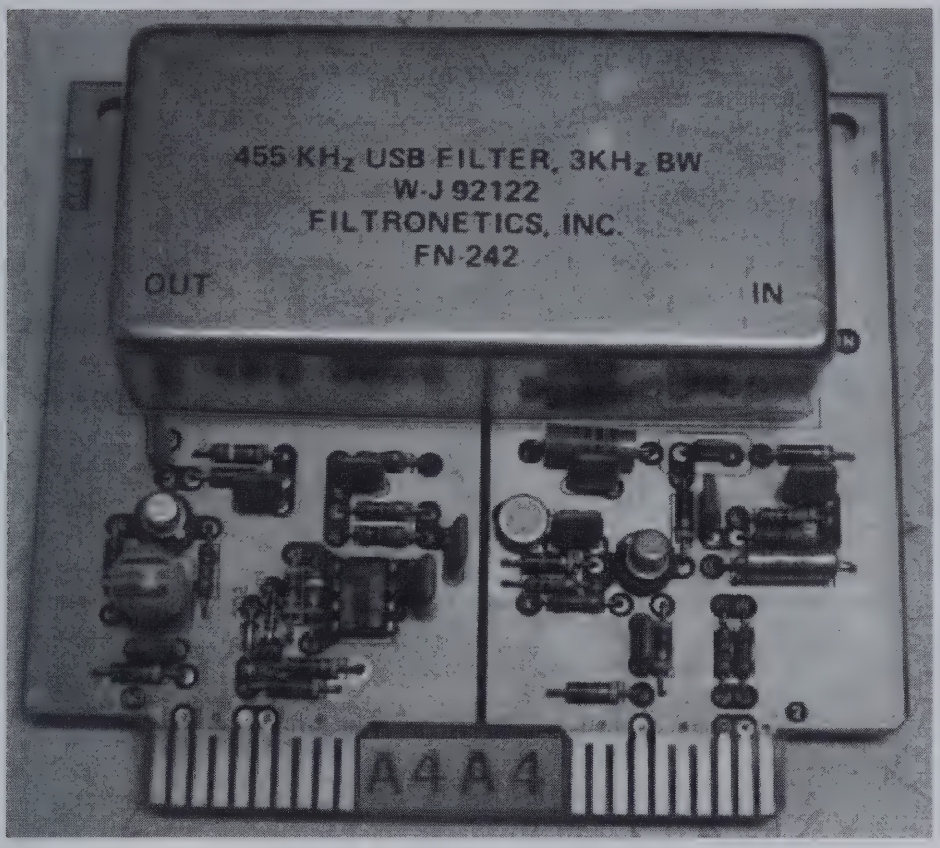
WJ-9949 speaker panel, five input, 1 watt output, half rack

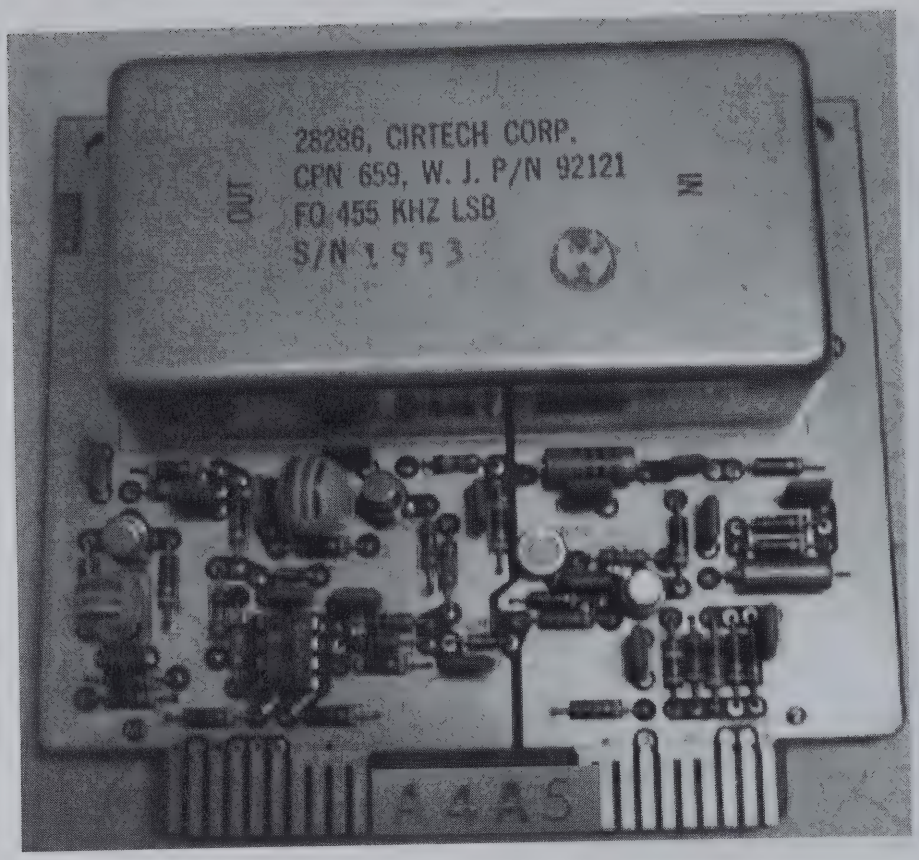
WJ-9950 speaker panel, on/off switch, unamplified

WJ-9951 equipment frame, similar to EF-201


FSN INC. 852
FSN INC. 933
A4A1


28286, CIRTECH CORP.
CPN 666, W, 1, P/N 92128
CF, 455 KHZ BW 325 HZ
S/N241 9
28286, CIRTECH CORP.
CPN 665, W, 1, P/N 92127
CF, 455 KHZ, BW 1 KHZ
S/N241 9
A4A3


455 KHz USB FILTER, 3KHz BW
W-J 92122
FILTRONETICS, INC.
FN-242
OUT
IN
A4A4


28286, CIRTECH CORP.
CPN 659, W. J. P/N 92121
FO 455 KHZ LSB
S/N 1953
OUT
IN
A4A5

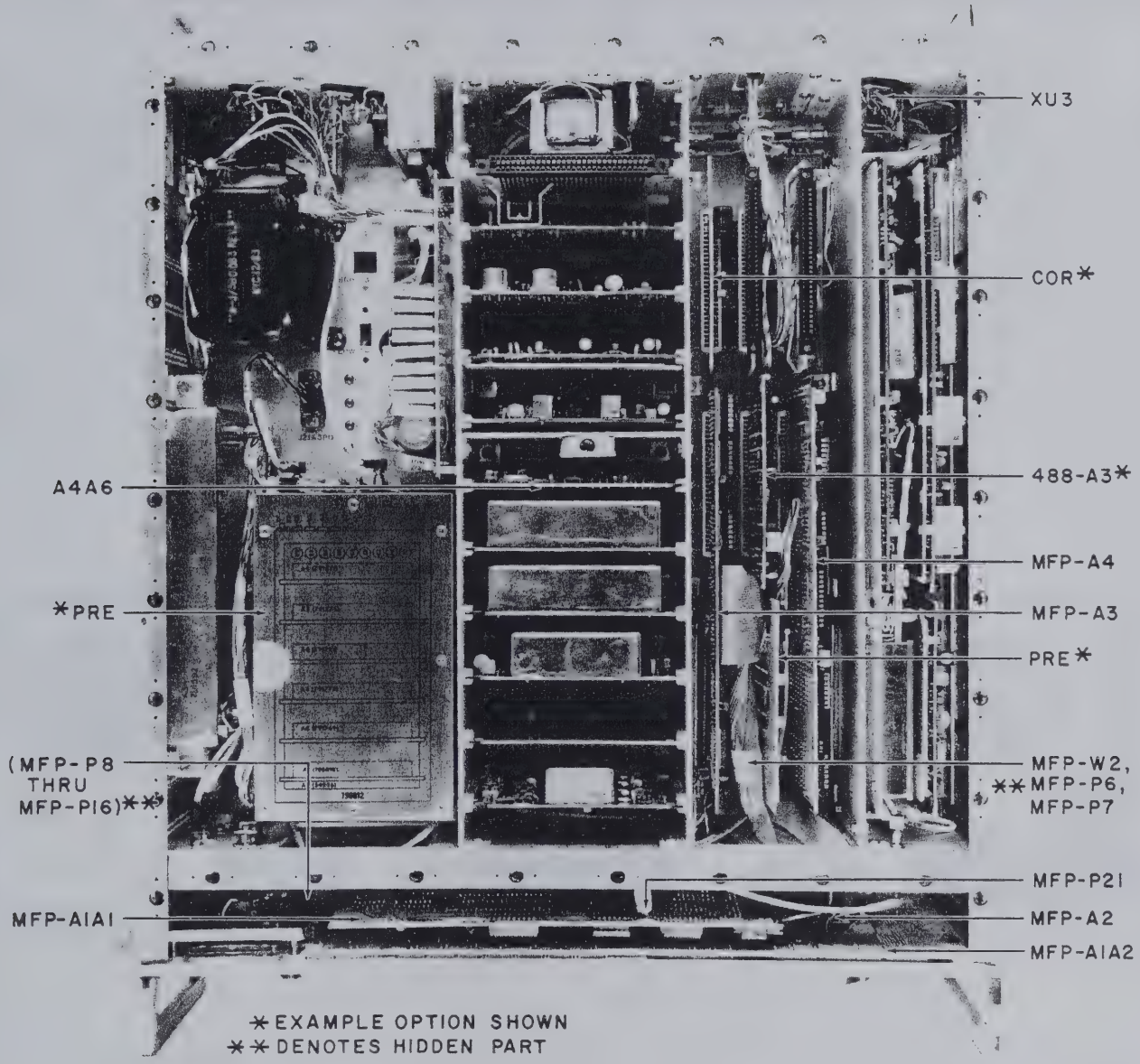
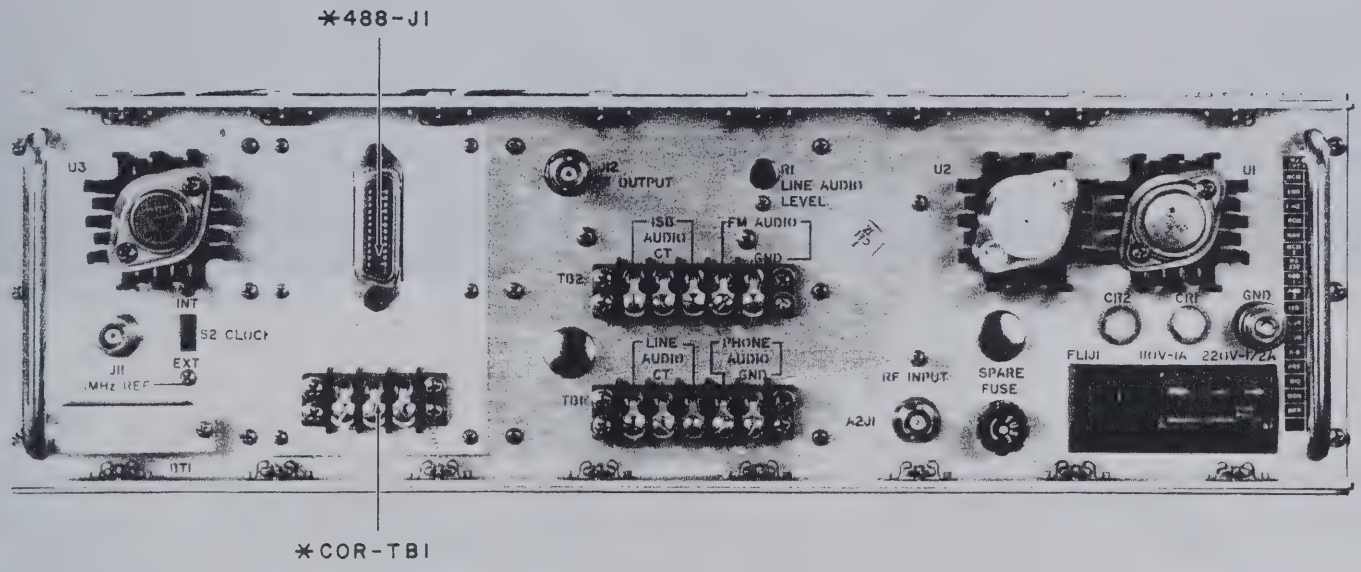


Figure 5-3. WJ-8718A/MFP Top View,
Location of Components

REF DESIG PREFIX **MICROPROCESSOR OPTION**

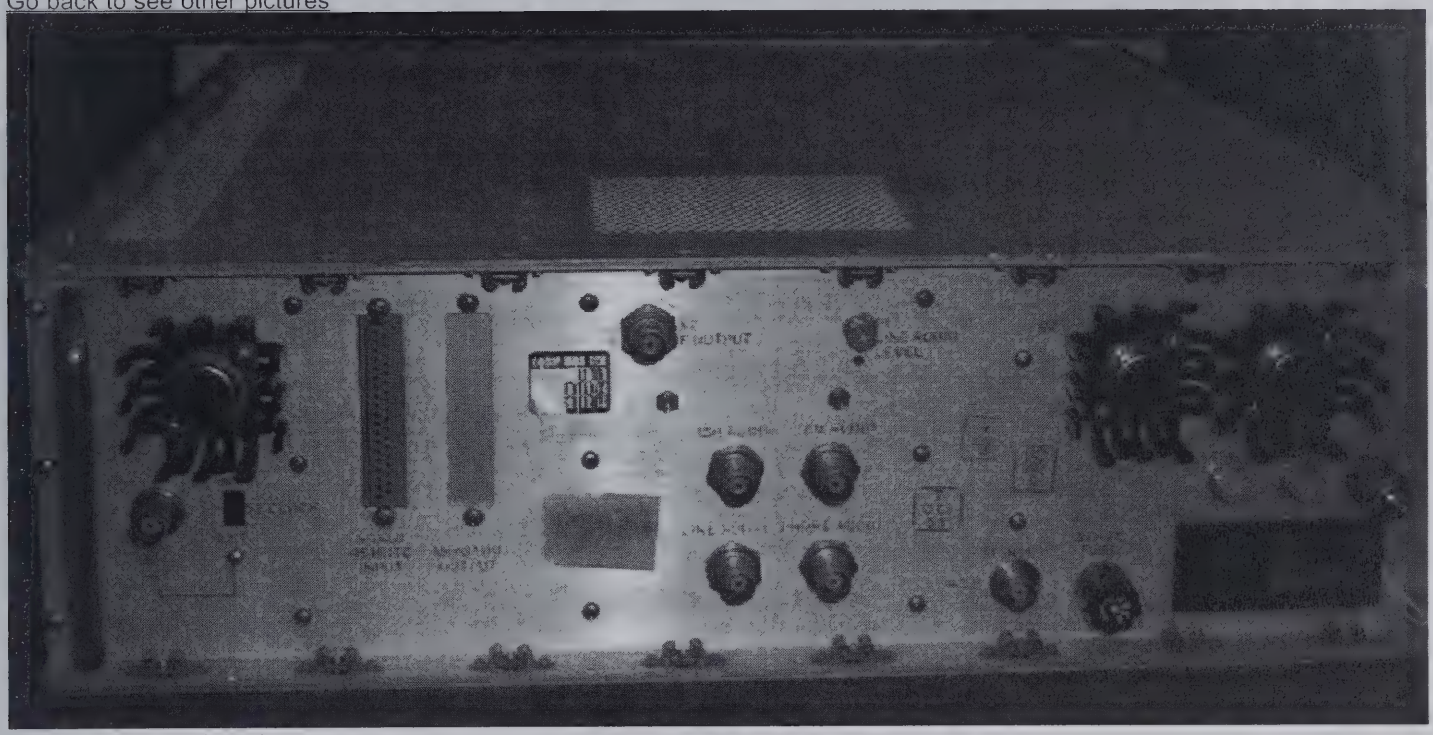
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
MFP-P21	Same as MFP-P8				
MFP-P22	Connector, Plug	1	87499-5	00779	
MFP-U1	Voltage Regulator	1	LAS1405	80103	
MFP-W1	Cable Assembly	1	371048-1	14632	
MFP-W2	Cable Assembly	1	380092-2	14632	
MFP-W3	Cable Assembly	1	380142-1	14632	
MFP-XU1	Socket, Transistor	1	8080-1G1	91506	
R1	Potentiometer, Modified	1	170422	14632	
R3	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W	1	CF1/4-200 OHMS/J	09021	
R4	Resistor, Fixed, Composition: 10Ω, 5%, 1/2 W	1	RCR20G100JS	81349	
XU3	Socket Assembly	X	380132-1	14632	



* EXAMPLE OPTION SHOWN

Figure 5-2. WJ-8718A/MFP Rear Panel, Location of Components

Go back to see other pictures



Go back to see other pictures

Payment Details	Payment Instructions
See Payment Instructions and item description, or contact seller for more information.	I will email actual carrier shipping cost following close.No packing or handling charge!

Bidding

WATKINS JOHNSON WJ-8716 RECEIVER-EXCELLENT

Item # 3020763130

Current bid: US $600.00

Bid increment: US $10.00

Your maximum bid:

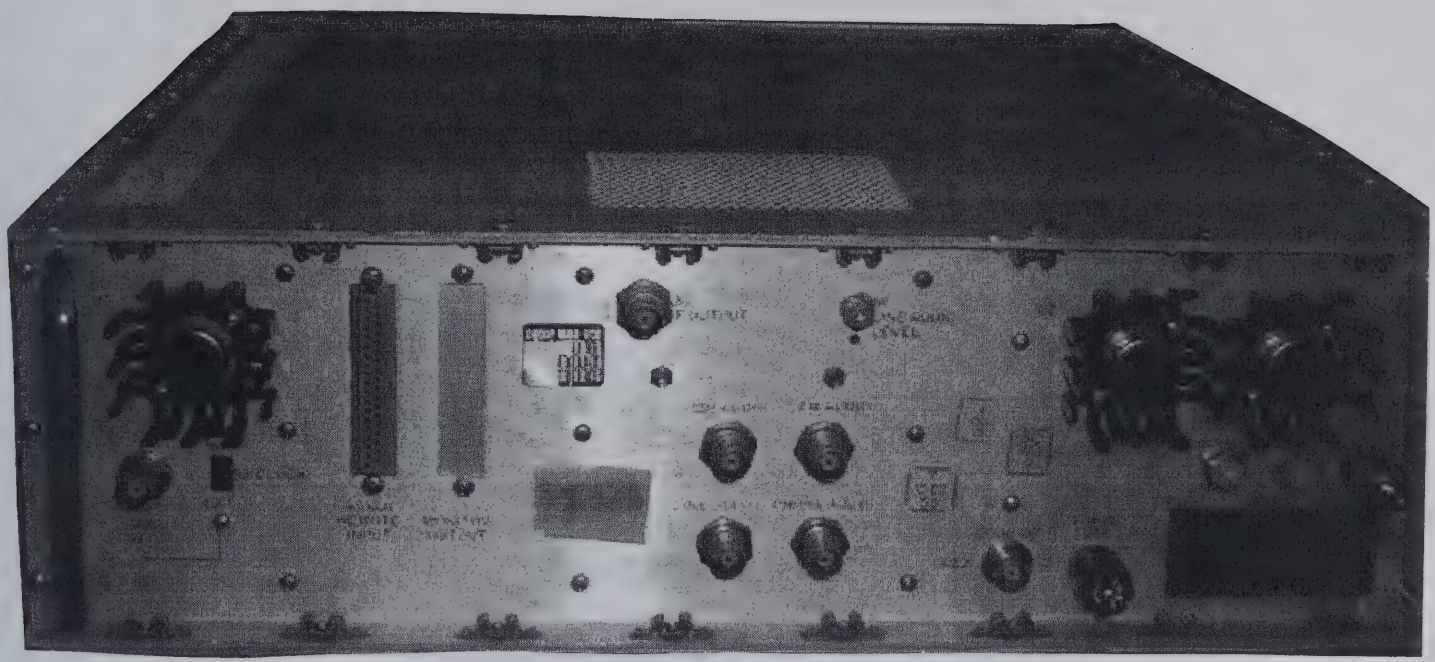
(Minimum bid: US $610.00)

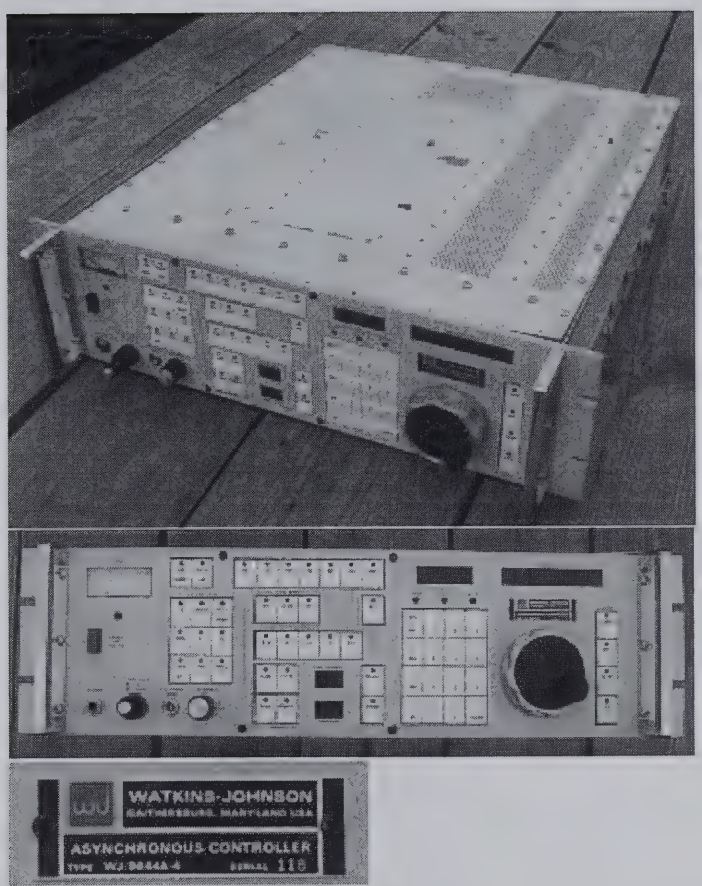
Place Bid

You will confirm on the next page

How to Bid

1. Register to bid - if you haven't already. It's free!
2. Learn about this seller - read feedback comments left by others.
3. Know the details - read the item description and payment & shipping terms closely.




WATKINS-JOHNSON
ASYNCHRONOUS CONTROLLER

WJ 8718 options

Options are listed on a tag on the back of the receiver. A diamond is cut out next to the designator. Since parts swapping is common, what is actually in the radio does not always match the tag.

- 232 - RS-232 I/O remote control
- 232M - RS-232 I/O for MFP option
- 488-2 - IEEE-488 I/O remote control
- 488M - IEEE-488 I/O for MFP option
- B10 - 10 Hz BFO tuning
- COM - command input module
- COR - carrier operated relay
- DDC - dual diversity combiner
- EM - extended memory (100 channels)
- FSK - frequency shift keying
- GRN - green LED display
- ISB - independent sideband
- IPP -
- LLA - low level audio output
- MCM - manual control module
- MCM-2 - manual control module
- MFP - microprocessor front panel
- MFS - mainframe spares module
- MON - status monitor module
- NAV - Navy option
- PRE - preselector
- RED - red LED display
- SMO - spectrum monitor output
- TK - tool kit
- 1HZ - one hertz tuning rate

This information came from Terry O' of the Premium RX list.

Back to WJ-8718 page

BACK to Radios

```
232   -  RS-232 I/O remote control
232M  -  RS-232 I/O for MFP option
488-2 -  IEEE-488 I/O remote control
488M  -  IEEE-488 I/O for MFP option
B10   -  10 Hz BFO tuning
COM   -  command input module
COR   -  carrier operated relay
DDC   -  dual diversity combiner
EM    -  extended memory (100 channels)
FSK   -  frequency shift keying
GRN   -  green LED display
ISB   -  independent sideband
LLA   -  low level audio output
MCM   -  manual control module
MCM-2 -  manual control module
MFP   -  microprocessor front panel
MFS   -  mainframe spares module
MON   -  status monitor module
NAV   -  Navy option
PRE   -  preselector
RED   -  red LED display
SMO   -  spectrum monitor output
TK    -  tool kit
1HZ   -  one hertz tuning rate
```

[Premium-Rx] Q: WJ 8718 micro boards and eproms

David McGinnis dmcginni at co.missoula.mt.us
Tue Jan 13 07:41:02 PST 2004

- Previous message: [Premium-Rx] Harris RF-4040
- Next message: [Premium-Rx] ISB
- **Messages sorted by:** [date] [thread] [subject] [author]

I've been working with a WJ8718(-17) receiver. My questions center around the two micro processor boards, radio options and firmware.

The 8718-17 originally did not have a preselector. After installing a preselector the radio did not work properly until the micro cards from the doner radio (radio that originally had the preselector) are installed. Everything is okay, except one of those cards had a leaky battery and are not reliable. (note: all batteries have been replaced).

I've found, at least with the radios I'm working with, the two cards (the one with the battery, the other with the ribbon cable going to the front pannel) are a set, and dont work if mixed and matched.

Original 8718(-17) micro card. Rev 1. This radio orignially did not have preselector. Has additional unused inline jacks (for remote control?) on micro card with battery. Has two proms, 8718-17 printed on them.

Cards from Doner radio. Rev 3. This radio had preselector, leaky battery, and cards function properly. Card does not have the additional inline jacks the Rev 1 card has. Has one prom. No radio model number printed, but later software date than Rev 1 card.

I've tried swapping proms and cannot get the Rev 1 card to work with the preselector. I'd also like to have the remote control capability, and suspect the unused inline jacks on the Rev 1 are for that purpose.

I've concluded since the preselector wasnt part of the original 8718-17 option set, it is not in the software (prom labled 8718-17) on the Rev 1 card.

THE QUESTION:

1: Has anybody done any work with the sofware versions in the proms. Swapping, or copying for adding options?

2: Are the unused inline jacks on the edge of the micro card for remote control? If so, what else is necessary? Just cables and a jack on the back? Is there also a software update? The Rev 3 card does not have these jacks, so how was remote control done in later radios?

Thanks
Dave

David McGinnis

Senior Deputy Sheriff,
Missoula County Sheriff's Department.
Communications Systems Coordinator,
Missoula County Department of Emergency Services.

200 West Broadway
Missoula, Montana 59825
office: (406)829-4277
cellular: (406)531-0303

- Previous message: [Premium-Rx] Harris RF-4040
- Next message: [Premium-Rx] ISB
- **Messages sorted by:** [date] [thread] [subject] [author]

More information about the Premium-Rx mailing list

Watkins-Johnson WJ-8718 AN/URR-74(V)

NSN: 5821-01-123-1743

5821-01-153-1216 (MFP COR ISB)

5826-01-431-6955 (NAV, MFP)

My WJ8718-17 S/N 3

INTRODUCTION

High Frequency receiver set. Used in EP-3E Navy aircraft and for "other" things..

- Frequency Range : 5 KHz to 30 MHz
  - Keypad selectable
  - VFO tuning
    - Fast - 1 KHz steps
    - Med 100 Hz steps
    - Slow, 10 Hz steps.
- Mode: AM FM CW LSB USB ISB,
- 325 Hz, 1 KHz, 3.2 KHz, 6 KHz 16 KHz Bandwidth, front panel selectable.
  - 42.905 Mhz IF
    - 28 Khz bandwidth (A3, input converter)

- 10.7 MHz IF
  - 16 Khz bandwidth (A3, input converter)
  - 6 KHz and 3.2 KHz crystal filters (A4A1 filter switch)
- 455 KHz IF
  - 1 KHz and 325 Hz crystal filters(A4A3 filter swith)
  - 3 KHZ USB crystal filter (A4A4 USB filter switch)
  - 3 KHZ LSB crystal filter (A4A5 LSB filter switch)

- 110 VAC 50-400 Hz

OPERATING

To start BITE on MFP model: Press the 1 , 7 and * keys. The BITE sequence provides a diagnostic test of front panel switches. Because the execution of the program is software dependent, the program also provides a test of the microprocessor, selected signals, EPROM and data lines. The program is accessed by engaging, in order the 1, 7 and * keys. The immediate effect of the BITE mode is illumination of all front panel LED's and display of zero in each 7 segment display (except the BFO sign).

To clear memories on MFP model: Press 1, 0 and * keys.

* key releases exam mode.

TECHNICAL

RF signals from the antenna enter through A2J1, BNC connector on the back of the chassis, to the A2 RF Filter Assembly. The A2 Assembly houses a 5 Khz to 30 Mhz 15 pole filter. Also present in the A2 filter assembly are two 6.2 volt Zener diodes in parallel to the RF path. RF leaves the A2 Filter Assembly and goes to the preselector (if present) or directly to the A3 Input converter in the absence of the preselector.

The A3 Input converter mixes the incoming RF in a WJ M9D balanced mixer with the 42.9 to 72.9 MHz 1st Local Oscillator signal. There is no pre-amplifier before the first mixer, and conversion loss is approximately 6 db. The first mixer is followed by a FET amplifier to restore the signals to their original level. The result is filtered in a 42.905 MHz crystal filter 28 KHz wide. The 42.905 Mhz signal is amplified. AGC signal is also applied here, and a gain reduction of up to 30 db can occur due to AGC action. The output is send to the 2nd Mixer, a WJ M9A balanced mixer where it is mixed with the 2nd Local Oscillator signal of 32.21 to 32.20001Mhz. The result is amplified and sent to a 10.7 Mhz crystal filter 16 Khz wide.

The 10.7 Mhz IF signal is sent to the 10.7 Mhz Filter Switch (A4A1) where the signal is either passed through or filtered by either a 6 Khz or 3.2 Khz filter. The signal is also amplified again in this section. Each of the three available signal paths, 6 Khz, 3.2 Khz or pass through, have their own amplifiers and gain control so the signal can be equalized between filters.

The filtered 10.7 Mhz if is now sent to the 10.7Mhz / 455 Khz Converter (A4A2). Here the 3rd Mixer, a WJ M6A mixer, uses the 11.115 Mhz signal from the third local oscillator to make a 455 Khz IF signal.

The 455 Khz IF is sent to the 455 Khz Filter Switch (A4A3) where, in similar function as the 10.7 Mhz filter switch, one of three possible signal paths are chosen. There is one important difference: When USB or LSB is selected, all signal paths are turned off and the IF passes through one of the SSB filters.

The WJ-8718 uses separate filters to achieve USB or LSB. There are separate filter switches, A4A4 and

A4A5 for each sideband. Each has an amplifier, and an adjustment to equalize gain between the two. The LSB filter has a bandwidth between 451.8 Khz to 454.75 Khz. The USB filter has a bandwidth between 455.25 Khz to 458.2 Khz.

VARIANTS

- WJ-8716
- WJ-8716MFP
- WJ-8718
- WJ-8718MFP
- WJ-8718-??

WJ-8716 was TEMPEST radio and had "better" shielding. After looking at the 8718, not sure how it could be much better. 8716 has BNC connectors on back in place of terminal blocks for associated audio and line wiring.

MFP - Microprocessor Front Panel. This is the model with all the buttons. The buttons adds 17 memories and scanning functions. MFP models have some different cards inserted in the A6 portion of the radio in addition to a totally different front panel.

Pre-selector was an option on some radios. In addition to the pre-selector box, there is a card that plugs into the A6 area that reads the BCD frequency information and sends commands to the pre-selector. There is also a jumper that mounts under the A6 mainframe. I was able to add a pre-selector into my radio as it was not originally equipped.

Option Codes are on a tag on the back of the radio. A diamond punch out next to the option. Often options are added or removed after the fact, so the list only shows how the radio was originally equipped.

IMPRESSIONS

Quiet radio with clean RX audio. Weak signals do not seem to "stand out" of the noise as they should, and there may be issues with my radio. Easy to use and simple controls. Without out the manual I figured out most functions on the MFP model in a couple minutes. VFO knob has good feel and is very smooth.

SSB filters are a bit wide. They are rather large 2.95 Khz crystal filters. Separate filters for USB and LSB, but are at 455 Khz. I have not found appropriate narrow USB and LSB filters, but it would be a big plus.

AM uses an envelope detector. According to the manual (I have one now), the detector operates at a high level for linearity. Since the receiver has a 455Khz IF output on the back, adding a synchronous detector like a SE-3 would be a snap. The AM detector card (also has an IF Amp on it), has enough room around it to add an internal synchronous detector on to it. Synchronous detector a big improvement. The detector I used is the WD8DAS kit, based on a Sony chip. Audio from the kit was not sufficient to drive the amplifier in the 8718, so an additional amplifier was added.

No internal speaker or 8 ohm out. 600 ohm terminal in line and phones terminals. Attaching a 8 ohm speaker will cause severe distortion. Use 600 Ohm to 8 Ohm transformer on phones terminals for an external speaker, or line connectors on a stereo amp.. Have noticed the audio amp runs hot when driving a speaker, even with impedance transformer matched. Have to run gain rather high to get good volume. Suggest using line level output to drive external amplifier. I use a JPS NRU-500 for this (not shown in the pictures, but is now mounted directly above the WJ in the rack).

Excellent construction inside and out. All circuitry is on plug in cards. Radios should have extender cards and tuning tool inside. Components on cards are "standard" types for easy board level repair. No surface mount.

These are old radios. The two I've seen have dates from 1980 and 1983. Because of their excellent construction and top quality components they will last a long time, but they were dirty, and had problems indicative of equipment that was kept in less than ideal circumstances (for instance, spider nests inside IC sockets). Be careful when going through them and if there are problems

look for physical problems first. Poor connectors, battery leakage, corrosion or oxidation on contacts. I was lucky and did not run into the bad tantalum capacitor problems I've had with other equipment of this era; however, I did encounter some bad ICs. Most ICs are in sockets and easily replaced. All are common and easily found and replaced.

REPAIR ISSUES

WARNING: These radios use a Data Sentry or Varta 2.4 V Ni-Cad battery on the microprocessor board. These battery have shown a tendency to leak a corrosive fluid over time. There are many solutions, the simplest is to replace with two AA Ni-Cad batteries in series on long leads that bring it away from your circuit cards. If you have equipment with this battery, replace the battery!

Geoff Greer relates : *"that vinegar is a great help when repairing a board that has the green battery crud on it. I just got done fixing a MFP with a badly corroded board. "*

In general, a through cleaning with De-Oxidizer is in order. All surfaces, all card edges, all sockets. Clean out any spider nests, etc.

USB, LSB or various filters not active: This was traced to U-15 on the MFO-A3 board, a 4050. Signal goes in, but does not come out. Some of the circuits in the U-15 worked, others did not. This IC is soldered in. Replace with new one and IC socket.

BFO does not stay in lock. Can not align, or can only align for one sideband. AM okay. Can fix BFO at 455 Khz by taping pins 41,42,43,44,45,47,49,51 and 53 on BFO card and shorting pin 43 to ground. Check U16 and U17 on Synthesizer Interface card. Both 74LS273 IC, both in sockets so easy to replace.

Front panel display intermittent problem: wrong digits on frequency display. Goes away with a tap on panel. Radio stays tuned. Cleaned connectors with de-oxidizer. Re-touch solder connectors on the long circuit board that comes off bottom of front panel board at right angle. Problem resolved.

Pre-Selector not functional on certain bands. Works on others. No signal on bad bands. Suspected IC on pre-selector card card. Not yet verified. Will advise.

AC hum on audio out. RF gain to manual and minimum setting. AF gain set up. This originating in Audio amp. Put caps to ground on +15, -15 and +22 volt lines but not eliminated. AC almost eliminated by putting 10 uf caps in series with both Audio out lines from U2 on A4A10 card (AF Amp). Other artifact noise also present, not AC. Source not determined.

WJ 8718 options

Options are listed on a tag on the back of the receiver. A diamond is cut out next to the designator. Since parts swapping is common, what is actually in the radio does not always match the tag.

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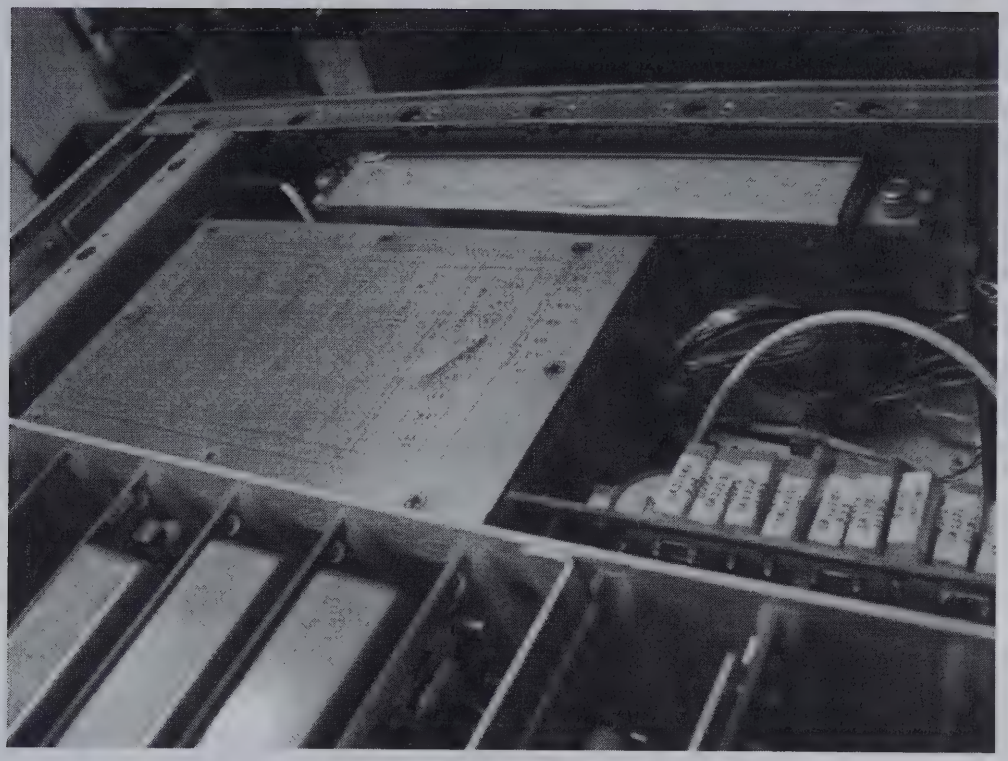
- 1HZ - one hertz tuning rate

This information came from Terry O' of the Premium RX list.

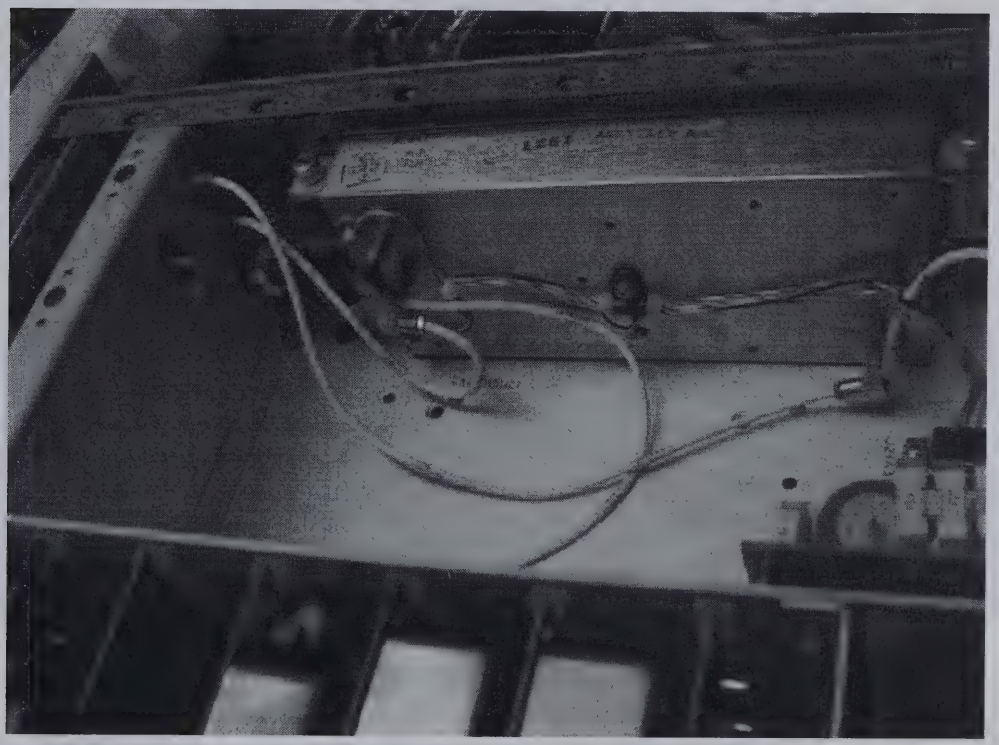
Back to WJ-8718 page

BACK to Radios

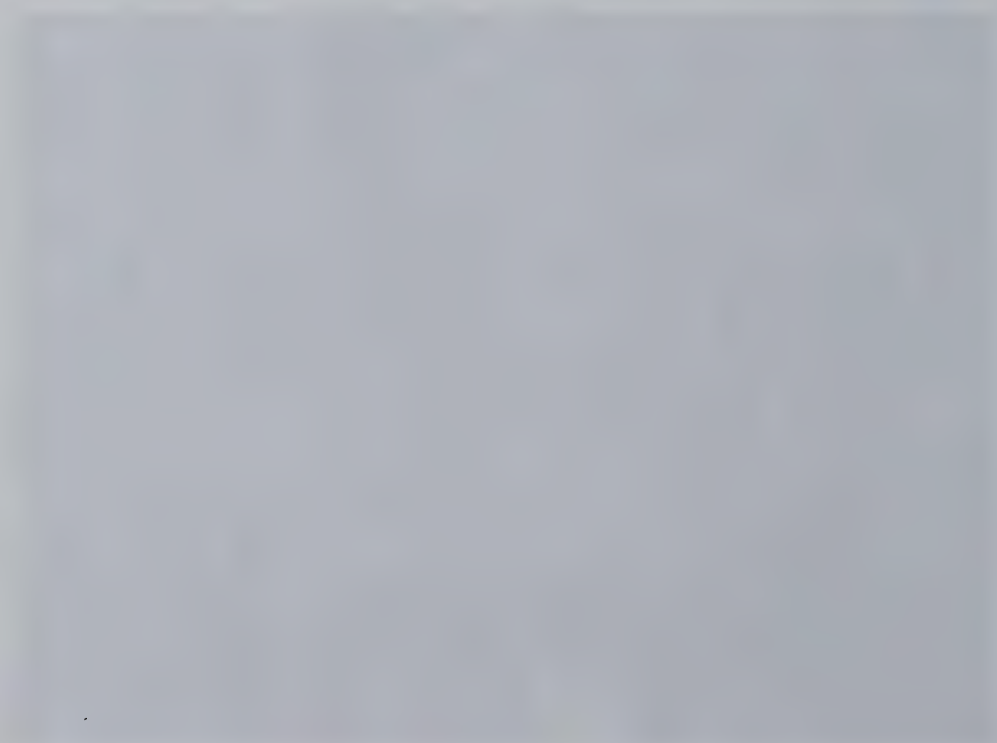
Watkins-Johnson WJ-8718 I



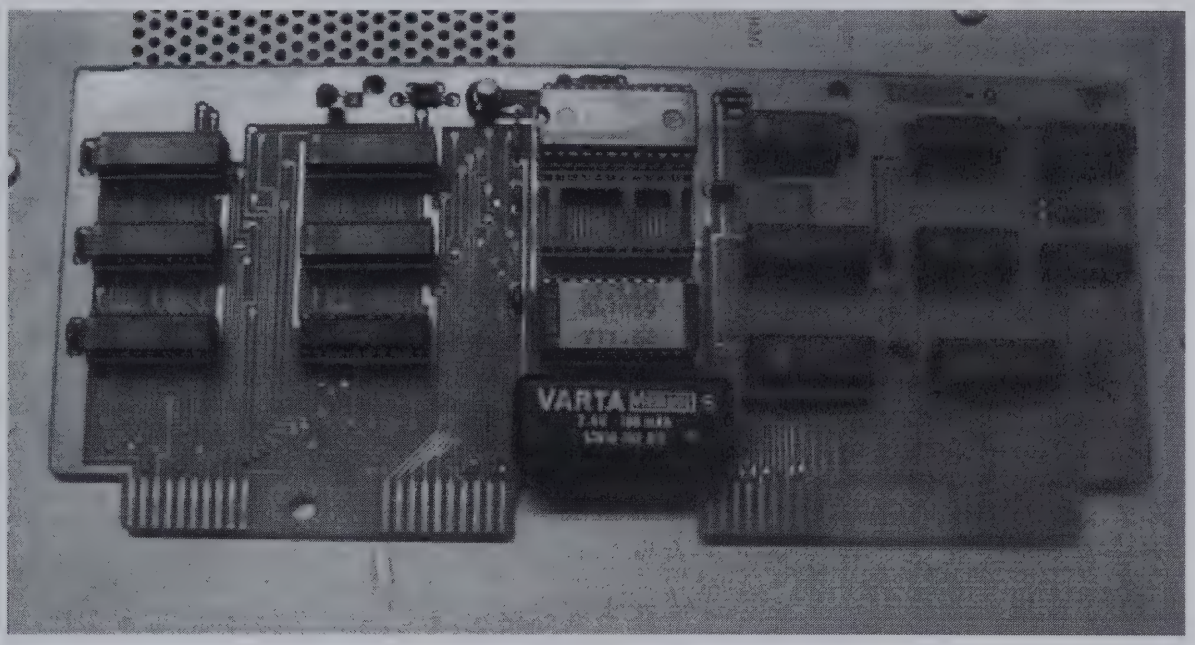
Picture of Pre-selector (the big silver box)



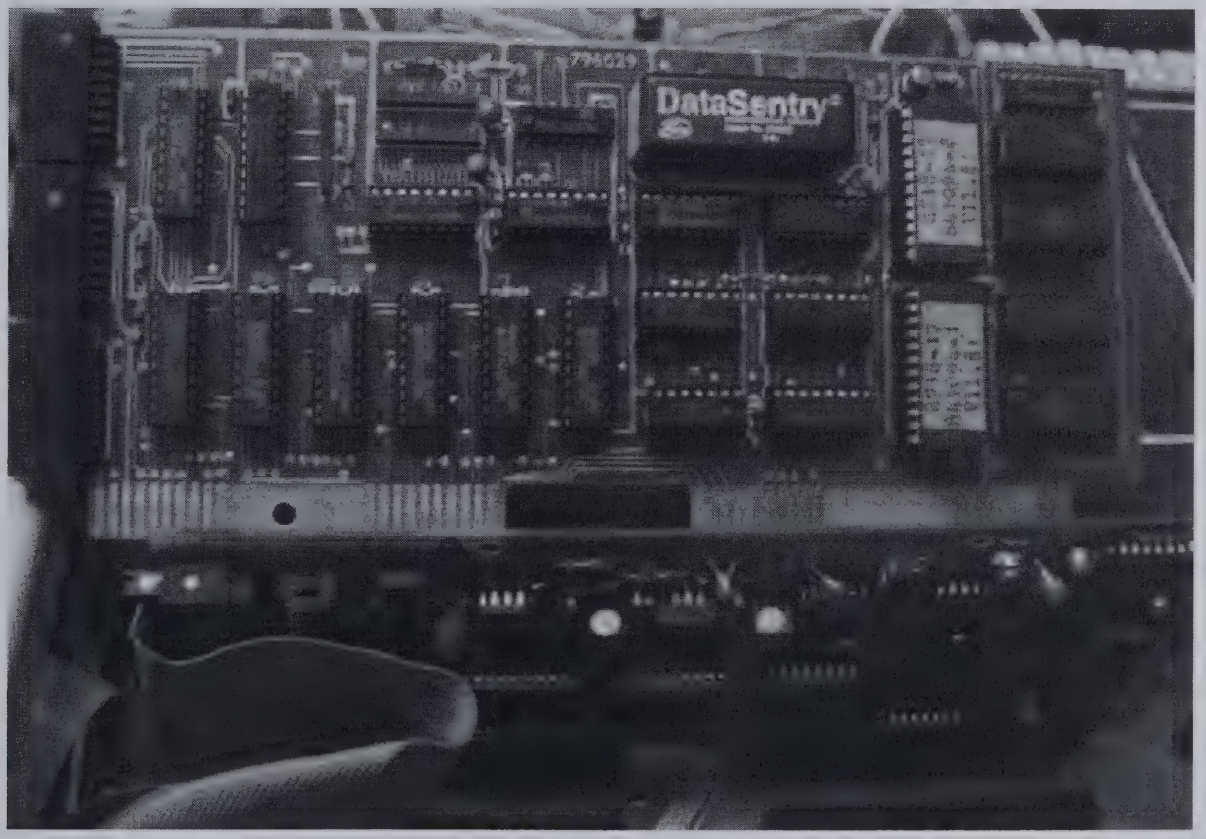
Receiver with out pre-selector. Smaller silver box in both pictures is first Input Converter, A3. This is where



42.905 IF and 10.7 IF mixing and filtering occurs.

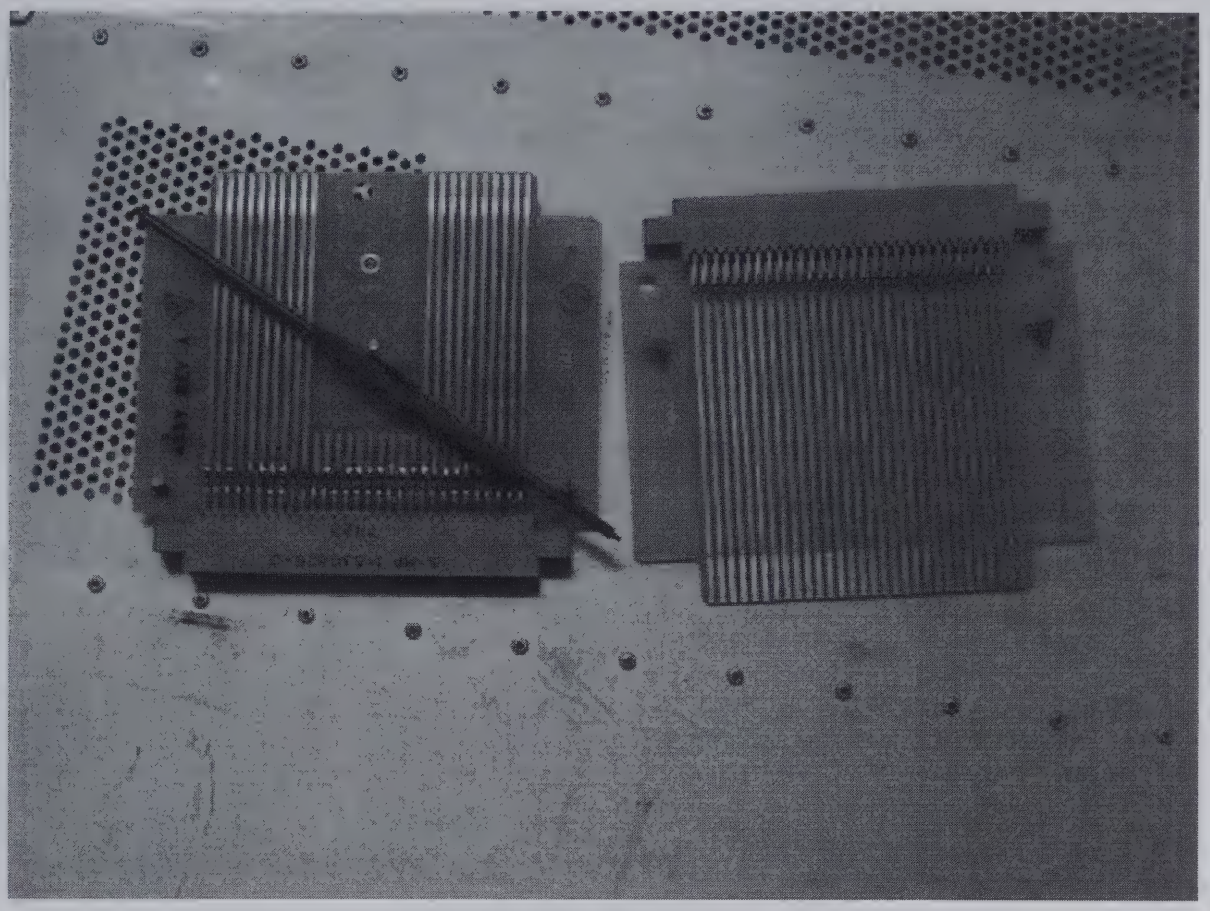


Synthesizer Interface Card (MFP-A4). This one was in a parts set, and was not used and returned to its owner. Not sure of the differences between this card and the Synthesizer Interface in my radio. Note VARTA battery. ***Get rid of these***. Replace with 2 Ni-Cad AA or similar cells.



This is a IF Interface Card (MFP-A3). This is a Revision 1 card from an 8718-17. Data Sentry battery. These are prone to leak nasty corrosive stuff all over the card, ruining it. The PRC-117 (RF-3090) radios had the same Data Sentry battery. I've seen several and they all leaked. Replace the battery! Its is a 2.4V Ni-Cad. The second card in the picture, still in the radio and pictured below the MFP-A3 IF Interface is the

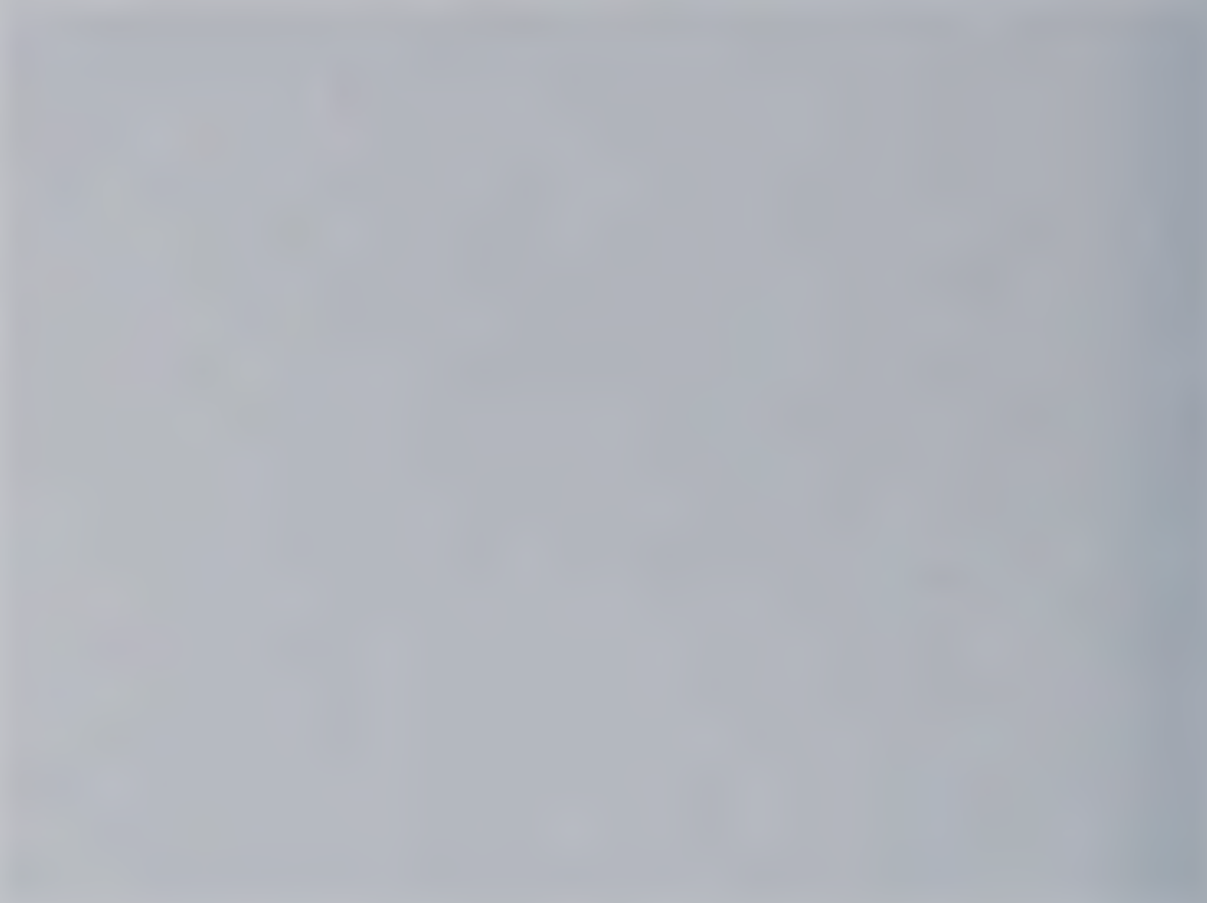
Synthesizer Interface Card (MFP-A4). These two cards are the principal difference between a MFP and non MFP radio (aside from the front pannel)



Card Extenders and tuning tool. There should be three card extenders inside the radio.

Back to WJ 8718 page

BACK to Radios



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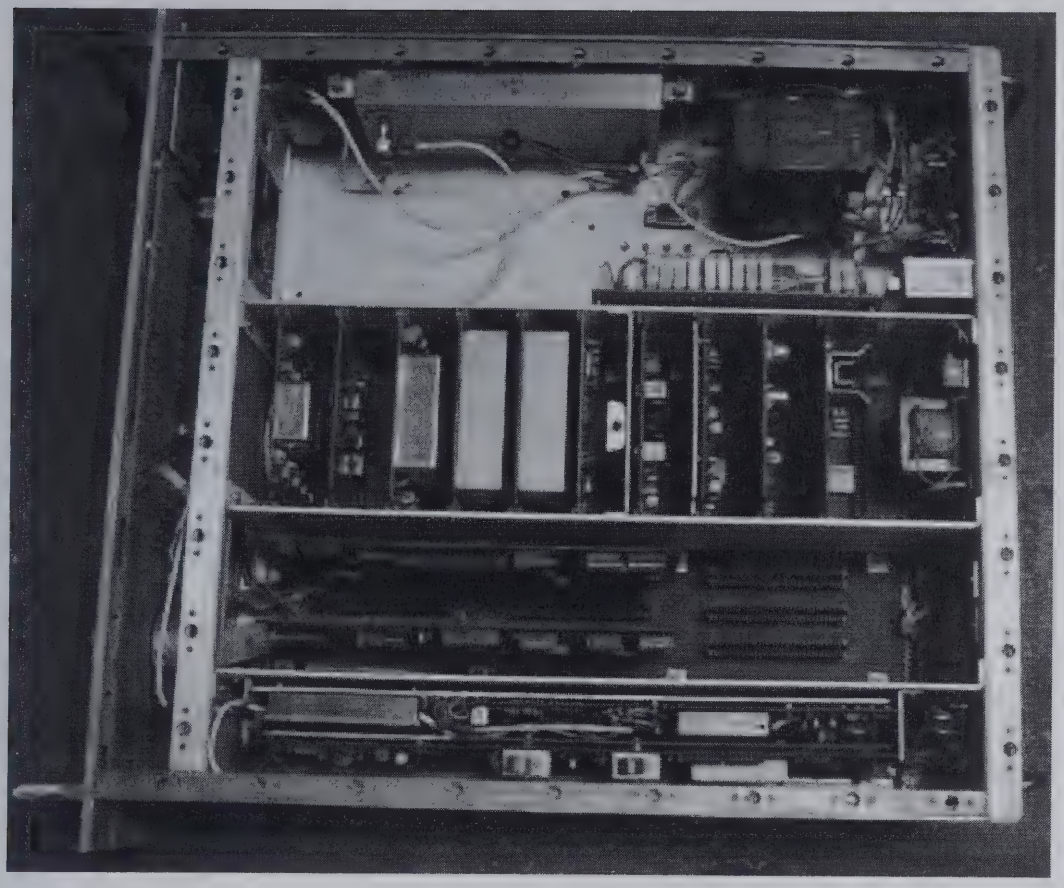

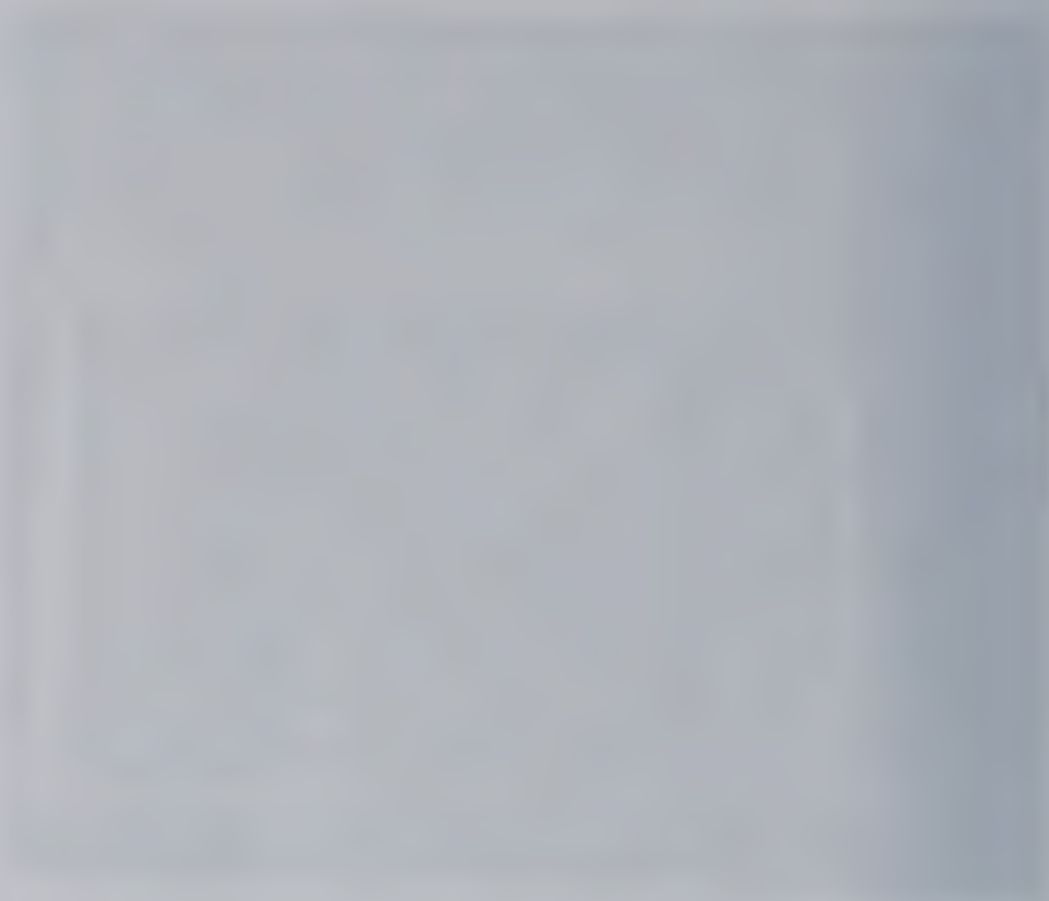

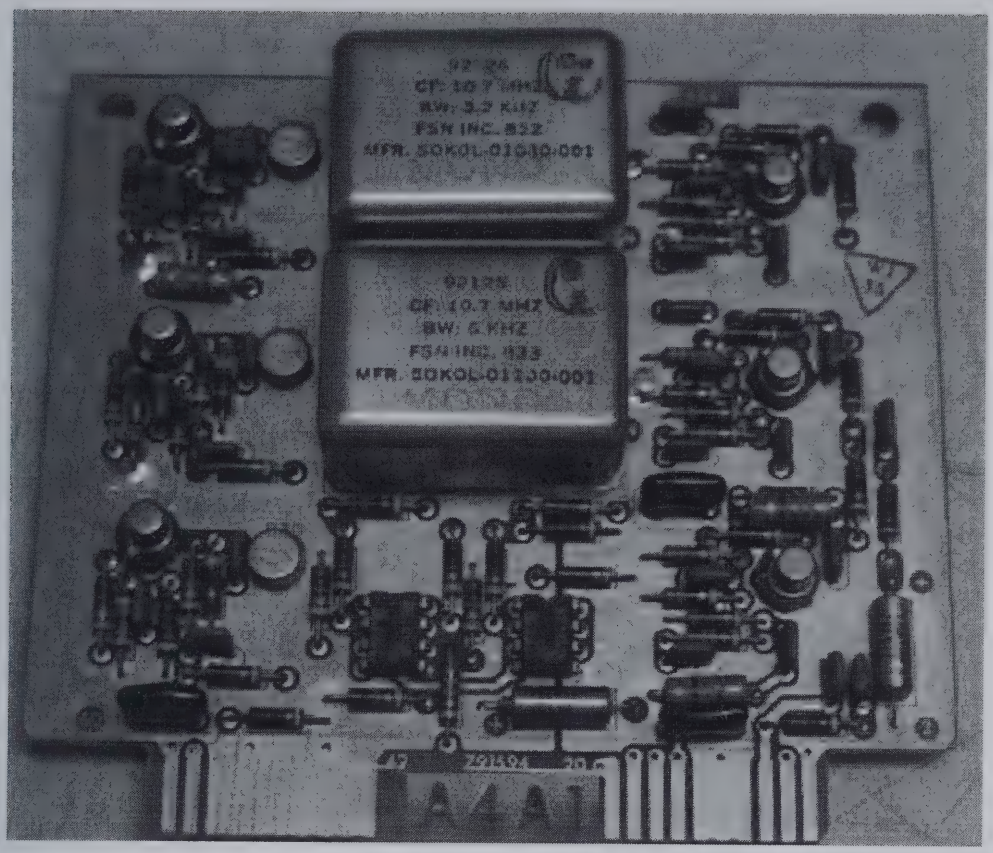
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BW: 6 KHZ
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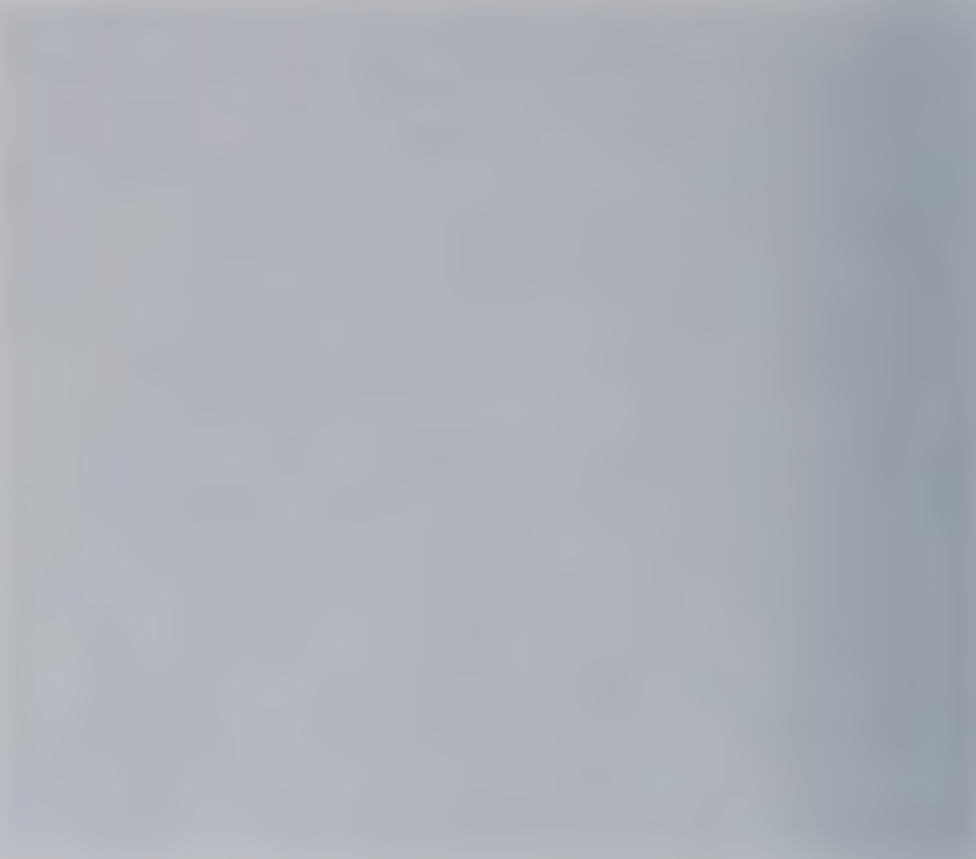
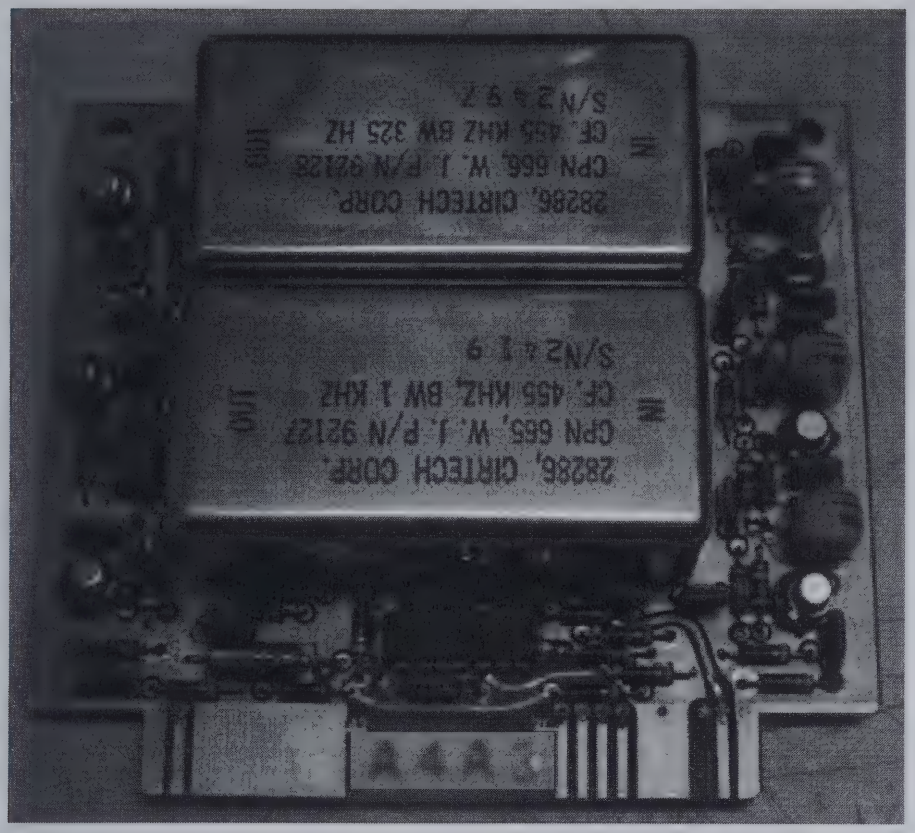
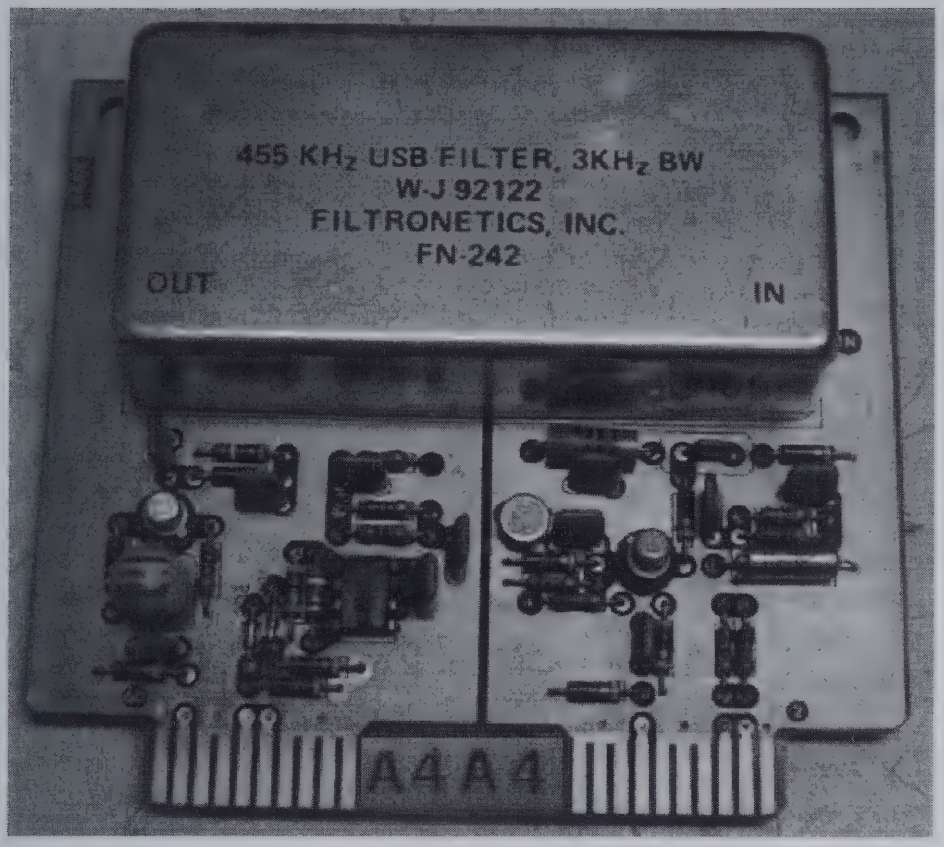
MFR. SOKOL-01330-001
A4A1




28286, CIRTECH CORP.
CPN 666, W. 1, P/N 92128
CF. 455 KHZ BW 325 HZ
S/N 2 9 2
28286, CIRTECH CORP.
CPN 665, W. 1, P/N 92127
CF. 455 KHZ. BW 1 KHZ
S/N 2 4 1 9


455 KHz USB FILTER, 3KHz BW
W-J 92122
FILTRONETICS, INC.
FN-242
OUT
IN
A4A4

Watkins Johnson 8716 and 8718 GPIB / IEEE488 Interface Setup

The setup for a WJ8716 GPIB is reasonably straight forward -- however it is important that settings are matched on each end of the link.

Step 1 -- Ensure that a 8716-8 circuit board is installed -- designated 488M option - circuit board 488-A3 -- this internal GPIB board (you have to remove the top cover) has a set of 5 DIL switches for setting the address.

Setting the Address via S1:

S1-5	S1-4	S1-3	S1-2	**S1-1**	**Address**
0	0	0	0	**1**	**1**
0	0	0	1	1	3
0	1	0	0	0	8

Note: 0 = open : 1 = closed

Refer: Technical Manual -- suggest setting to address 1 initially.

Step 2

Obtain a standard shielded GPIB IEEE 488 cable so that you can connect the 8716-8 to a GPIB Card installed in the PC.

Step 3

Install a National Instruments (NI) GPIB card in the PC (the CEC 488 card in NI mode also is fine ...) -- PCI or ISA Plug-Pay / TNT and adhering to the 488.2 standard. Fairly expensive -- but readily available on the surplus market. e.g. eBay There are three setup diskettes to install this device. Minimum install is for the drivers only.

During install or via the Control Panel -- in Win95/98/XP/ME/2000 set the Interface Name as GPIB0 -- generally it will default to this name.

Step 4

Install VRADIO and via the Setup Menu -- select the Port as GPIB -- the receiver as **WJ 8716-8** -- and make sure the address is set to the settings of step 1. e.g. 1

Finally, if you have any questions/problems -- call/email CGT Associates for support.

*****

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HF Receiver Design

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Printed in U.S.A.

HF Receiver Design

The most widely-used frequency spectrum is the high frequency band of 0.5 to 30 MHz. Many HF Receivers, some of which have served continuously for the past twenty-five years, are used by government and amateur operators alike, and number in the hundreds of thousands.

In an age where technology is moving toward ever-increasing automation, the need for manually-controlled receivers has diminished, while the need for remotely-controlled receivers that require fewer operators has triggered a revolutionary change in receiver design concepts. Some of the improvements that have been made by manufacturers to their line of HF Receivers include ultra-high tuning accuracy, high dynamic range signal handling, and computer control of receivers. Although many receivers are designed to serve specific purposes, there is also a need for a low-cost, high-performance, general-purpose receiver that will meet the requirements specified by today's user. This article deals with the techniques, problems, and solutions encountered by the Watkins-Johnson CEI Division in the development of a low-cost, general-purpose receiver (WJ-8718). This article does not dwell on the theoretical electronic aspects which naturally embrace the development of any complex new product, but it does discuss the physical and mechanical layout techniques which need to be followed to produce a low-cost product that adheres to the strict specifications that are offered by more costly, special-purpose receivers.

The major concerns in the development of a general-purpose receiver are those of designing a low-cost product (about one-fourth the cost of standard receivers) and, at the same time, building into that product the high performance operation of the more costly receivers. To accomplish this task, it is necessary to develop special techniques for fabrication, assembly, test, and component purchasing.

Fabrication

To keep manufacturing costs to a minimum, the fabrication of the Watkins-Johnson Company general-purpose receiver included elimination of all milling and tapping of chassis material; only punching, bending and casting of parts was allowed. Additionally, the requirement for loose hardware, such as nuts and washers, was kept to a minimum. Special emphasis was placed on the time required to wire the main chassis. Other electrical assembly requirements, such as pre-bending of components and machine-assisted printed circuit board assembly, were integrated into the fabrication design.

Because of the complex nature of the receiver, automatic test equipment was developed for module, receiver diagnostic, and final tests. Simplicity of receiver testing procedures provides an efficient method by which units can be tested by individuals possessing only basic technical knowledge.

As with most manufacturing projects that require a strict adherence to low production costs, purchase of parts is made on a high-volume basis, directly from the factory.

Performance

Some of the performance goals established for the new HF Receiver included stringent shock, vibration and temperature specifications, the capability of changing performance and control by addition or deletion of modules, and ease of troubleshooting and maintenance.

Engineering

Designing a general-purpose receiver within strict cost and labor boundaries led to the idea of dividing the receiver into plug-in modules by function, as well as designing these modules in such a way that for any necessary repair or assembly, the number of solder connections is eliminated or, at least, minimized. Also, since the prevention of EMI (electromagnetic interference) and system overheating are problems that dominate receiver layout, new interconnection design ideas for solutions to these problems were developed. One additional provision to facilitate receiver fault analysis is the positioning of test points on a single side of the receiver. This will allow all fault locations to be made at the module level.

Receiver Layout

The proper receiver layout is the key to the solution of EMI and heat problems. A block diagram showing the interconnecting points of the HF Receiver is shown in Figure 1. The EMI and heat distribution, as shown in Figure 2, make it imperative that EMI-susceptible modules be separated from those generating EMI. It is also important that input/output and control lines not enter any compartments unless the compartments are EMI-neutral. Modules with inputs and/or outputs leading to any external parts of the receiver should be mounted against the rear panel, while neutral modules can share the same area. Heat-generating modules should have access to a rear or side panel. Heat from the regulators will dissipate outside of the receiver. Once the proper module separations have been made, a re-interpretation of the original block diagram in physical form can be drawn, as shown in Figure 3.

The RF-input converter module, which is EMI-susceptible, is contained within a brass enclosure located as far away as possible from the synthesizer, since the synthesizer is an EMI generator. The high dynamic range of the RF converter requires large amounts of power to be dissipated internally. The converter is, therefore, mounted to the sideplate. Because the IF section is, in effect, a narrowband amplifier, it is less susceptible to EMI, although it does require a certain amount of shielding. The internal control section is implemented in low-power CMOS, and will not generate EMI. Control lines from the front panel or from external control need not be shielded if the other modules are sufficiently shielded. This arrangement provides efficient EMI control of the receiver and allows a through channel from the

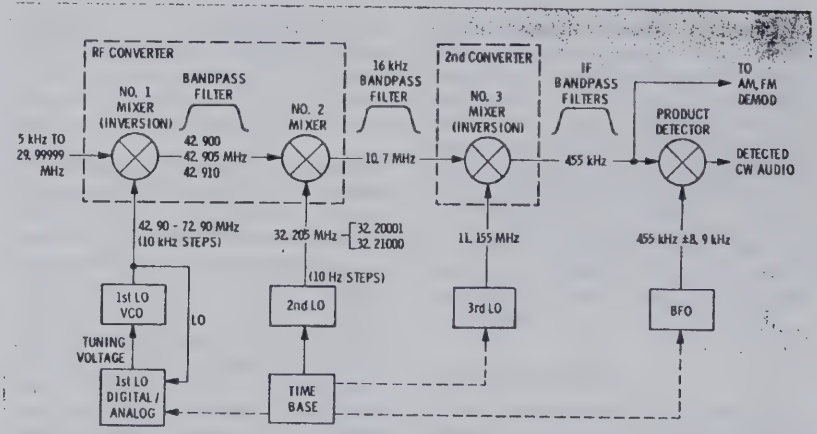


Figure 1. Digitally-controlled HF receiver frequency plan.

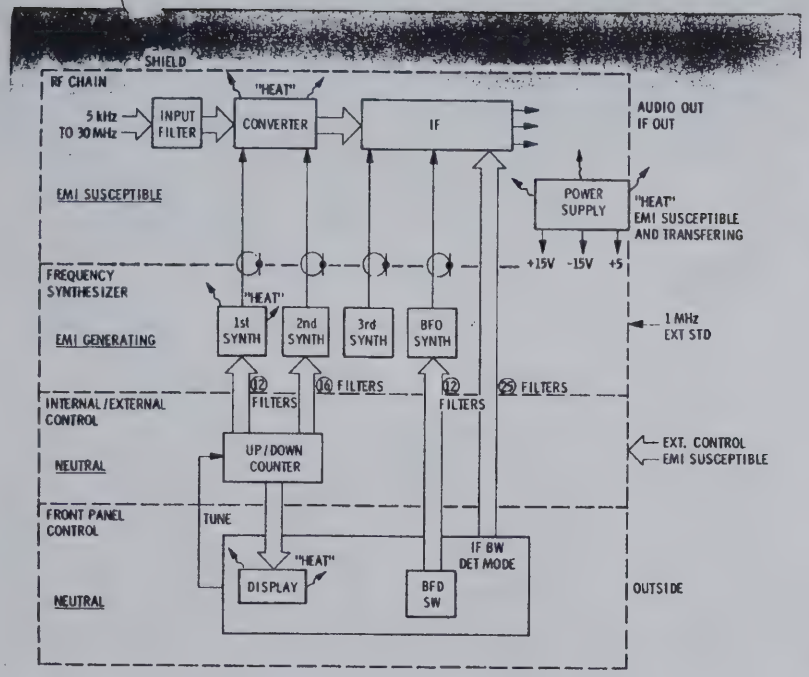


Figure 2. EMI and heat distribution of the HF receiver.

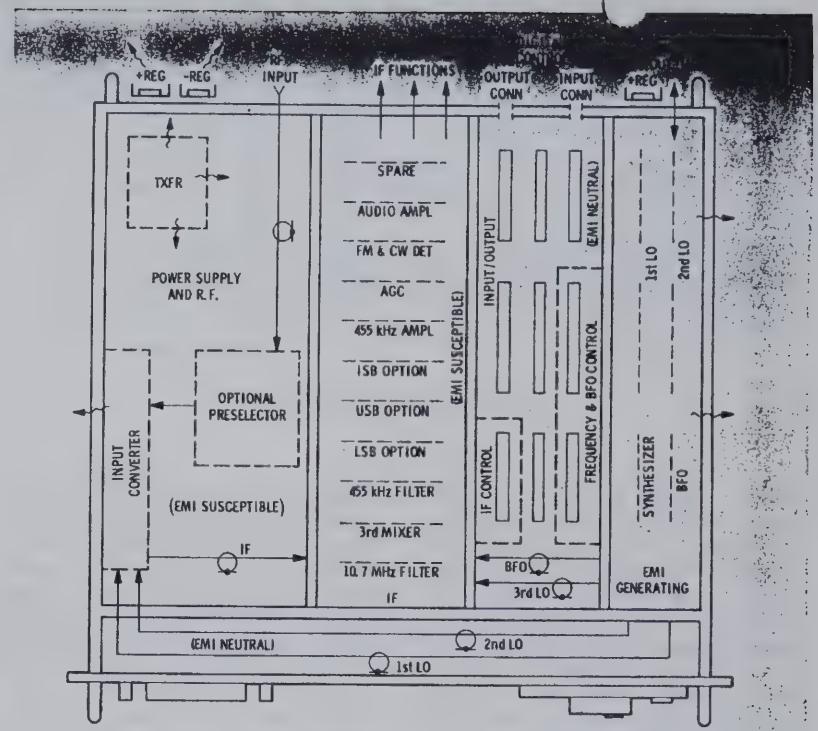


Figure 3. Digitally-controlled HF receiver chassis layout.

rear to the front panel for the remote/manual control requirements.

Control Section

The control section of the HF Receiver utilizes three connectors of a nine-connector input/output (I/O) control mother board (see Figure 4). The six remaining connectors are supplied ±15V and +5V and are designed to have an additional capability of 20 watts. Optional cards plug into the I/O control mother board. Present options and most future options will use plug-in ribbon cables for card interconnections. Some of the present options include: (1) Preselector Control (automatic selection of preselector bands), (2) Manual/Remote Control (frequency bandwidth controlled by 32 lines), (3) IEEE 488 Digital Interface (total remote control), and (4) Independent Sideband (USB, LSB, or both). Some of the future options will include 1-Hz tuning and microprocessor control.

Problems and Solutions

One of the most complex problems encountered in the HF Receiver design was finding a method of controlling the receiver from the front or rear panel without the control lines acting as a coupling link between the RF/IF stages and synthesizer, or between the synthesizer and any external outputs. The cost of shielding a total of about 75 control lines between the IF and synthesizer control, utilizing low-pass filters with stop bands to the required gigahertz range, might easily exceed the cost of the entire main frame.

In search of a solution to the problem of control-line shielding, it was found that the use of single or tandem ceramic capacitors would provide unwanted signal attenuation only over a narrow frequency range, because of the resonant nature of the capacitor and its leads (see Figure 5). Also, lines connecting through a partition are affected by EMI signals due to the existence of exposed wire following the capacitor bypass. The combined solution to both problems is in the utilization of a special type of flat, flexible cable to make interconnections. Each flat cable is wrapped with metal foil, which adds about 100 pF to each line, thus providing higher frequency filtering as well as a leadless ground. Two 29-line cables are used for the synthesizer section and one cable is used for the IF section of the HF Receiver (see Figure 6). The filtering provided by using the flat-cable technique is about one-fifth the cost of conventional line-filtering techniques.

Input Converter

The performance of a receiver is directly related to the design of the input converter. Generally, the material cost and direct labor necessary to pro-

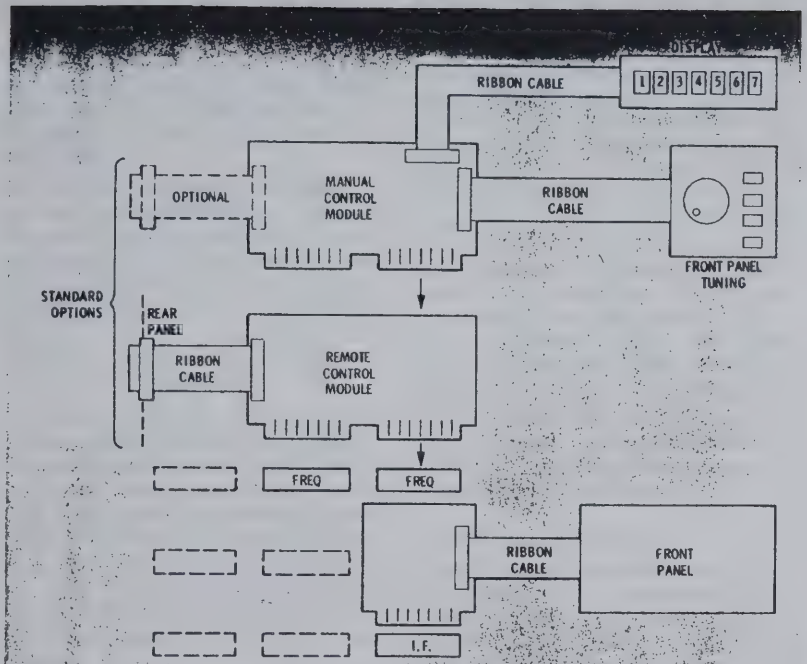


Figure 4. HF receiver panel and remote control.

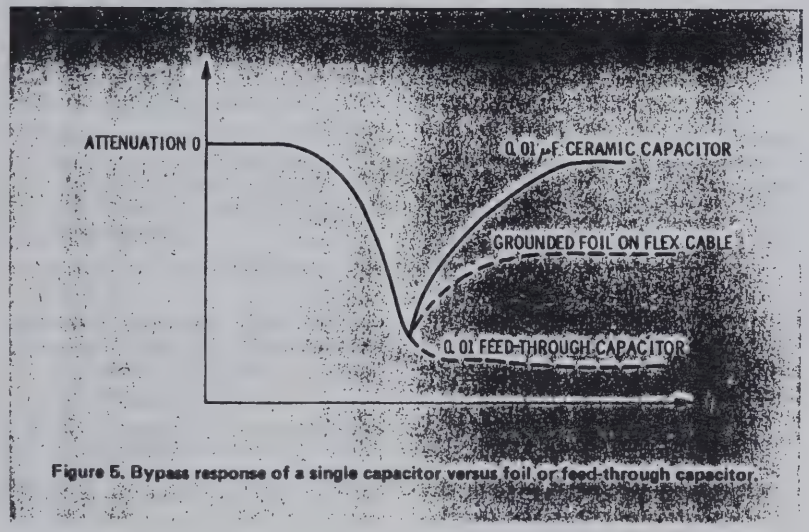


Figure 5. Bypass response of a single capacitor versus foil or feed-through capacitor.

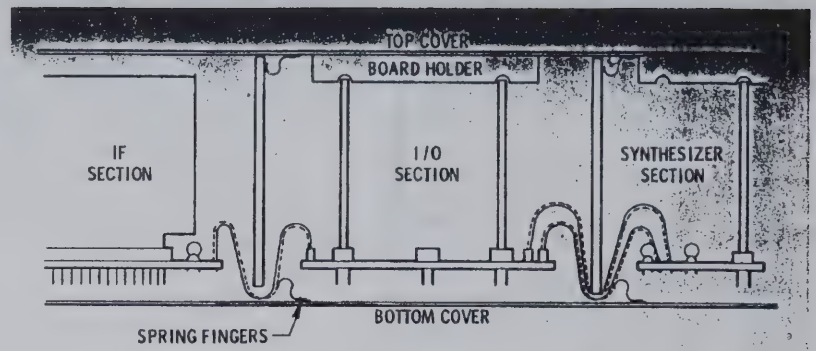


Figure 6. EMI shielding arrangement.

duce the input converter module is such that it becomes one of the most expensive component parts of the HF Receiver. For example, the input converter may consist of a multi-partitioned brass box with point-to-point wiring and a dozen separate adjustments. A new design concept has reduced the HF receiver's input converter module to two printed circuit boards with one partition and two single, peak-tune adjustments.

A design comparison between an earlier converter and the new input converter is shown in Figures 7A and 7B. The previous design achieved greater than +20-dBm, 3rd order intercept point and less than 15-dB noise figure. The 8-dB amplifier located before the mixer is used to compensate for the loss of the mixer. To achieve the necessary specifications, the amplified signal requires a greater than 28-dBm, 3rd order intercept-point mixer and a 7-dB power amplifier to drive the mixer. Also, converter post stages need extra high signal-handling capability to maintain the required intercept point. From this simplified explanation of the operation of an earlier type of input converter, it can

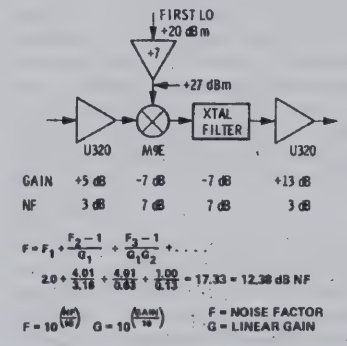


Figure 7A. Earlier input converter design.

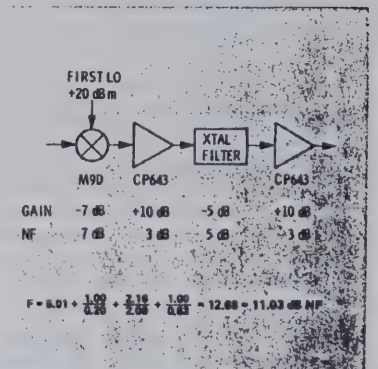


Figure 7B. New input converter design.

be seen that to achieve the required noise figure, while maintaining the necessary signal-handling capability, an amplifier must be placed before the mixer; this arrangement causes an increase in the cost of the input converter stages.

In designing a general-purpose HF receiver, a large reduction in cost can be made by the elimination of the amplifier and by the reviewing of each stage for noise figure, 3rd-order intercept point, and gain. In the CEI design concept, these parameters were improved until the arrangement shown in Figure 7B was achieved.

All other assembly, such as main chassis wiring, is done using military-type crimping techniques. Much of the wiring is done by utilizing mother boards equipped with pressed-in, wire-wrap, printed-circuit connector pins. This type of wire-wrap pin provides an array of test points to facilitate troubleshooting — an important factor in the achievement of low cost diagnostic.

Receiver Characteristics

As mentioned previously, receiver design and electronic components have undergone major improvements in the past few years. Some of these improvements, as well as some standard techniques have been incorporated into the design of the CEI general-purpose receiver. They include:

(1) triple conversion to provide maximum control of spurious mixer responses, image frequency rejection, and IF frequency rejection (see Figure 1),

(2) extended input frequency range to 5 kHz,

(3) multipole crystal filter following each conversion for optimum selectivity and passband stability (see Figure 8),

(4) low distortion, two-watt line audio power,

(5) high resolution, signal strength meter.

High-Volume Production

While many conventional receiver modules are constructed entirely by one individual, the WJ-8718 modules travel to several stations before completion. At each station, components are inserted into oversized holes in the printed circuit board. The oversized holes not only speed up the component insertion procedure, but also facilitate extraction of components if maintenance is required. Component leads are soldered with a wave soldering machine and automatically clipped with a rotating blade. This type of high-speed production produces completed printed circuit boards much faster than conventional assembly lines using the same number of personnel.

Automatic Testing

High-volume production, such as is involved in the manufacture of a general-purpose HF Receiver, necessitates the utilization of automatic testing equipment for modules as well as for the main chassis. An automatic printed circuit board tester is used which is capable of component-level tests and verification of analog and digital circuit parameters. Faulty component locations are automatically identified, and the pertinent information is printed out so that the necessary repairs can be made.

The module troubleshooting arrangement consists of a microprocessor-based, system controller/analyzer, which is augmented by both solid-state memory and floppy-disk memory. The testing procedure is accomplished by the performance of a preprogrammed set of tests that take place through a vacuum-actuated "bed-of-nails" which makes contact with each circuit node. This singular procedure makes it possible to component-test a printed circuit board in a few seconds.

Functional testing of the printed circuit board can be executed if the test signals are less than 1 MHz in frequency. Modules of higher frequency are tested by masking all pins except those leading to the power supply and control lines. Module troubleshooter test equipment is then connected to the inputs and outputs, thus allowing automatic verification of the module transfer function. The operator steps through the tests manually, and reads the results on a viewing screen along with pass/fail verifications.

Functional testing, even when manually executed, takes only a few minutes (including adjustments) per printed circuit board. Failure data for each module is logged into a memory bank, and is used to detect failure mode trends in components.

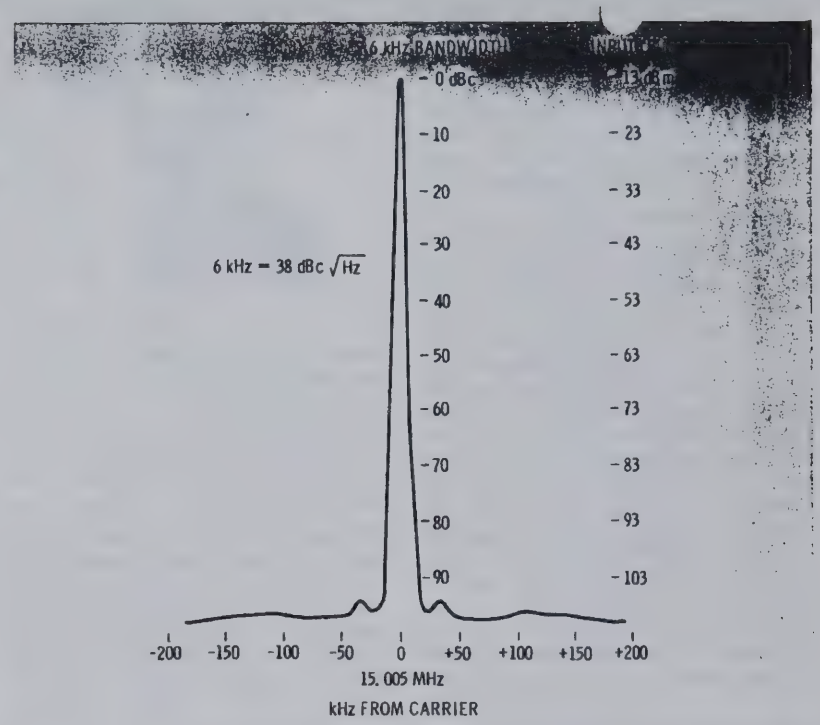


Figure 8. A multiple filter following each conversion provides optimum selectivity and passband stability.

The main chassis is tested using a printed circuit test board which, when plugged into four different locations, will give a lamp indication if all voltages are correct. All modules are operated while in the main chassis for a burn-in period of 96 hours at 50°C.

After the burn-in period, the receiver is connected to an automatic diagnostic test set which operates similarly to the module tester, except that it utilizes a "bed-of-cups" that makes contact with wire-wrap type pins located beneath the mother boards. A sequence of tests is then automatically performed to detect any module failures that occurred during the burn-in period. Receivers which pass the automatic diagnostic test are reconfigured for final test.

The final receiver test is performed using automatic test equipment controlled by an HP-9825 computer. A special IEEE-488 type remote interface printed circuit board is temporarily plugged into the I/O section of each receiver. All connections between computer, test equipment, and receiver are controlled by the general-purpose interface bus (IEEE-48).

The HP-9825 exercises the receiver through twenty-three separate tests, while automatically measuring the receiver's outputs. A final test printout is produced showing all test parameters and final test data. The final test procedure is an extremely efficient test method, which reduces three hours of manual testing to a few minutes. This array of automatic test equipment and procedures is also used to repair any units returned from the field.

New Designs

In the past few years, HF Receivers have undergone radical design changes, mainly because of the need for higher dynamic range and remotely controlled applications. As it becomes necessary to replace older receivers, it is generally true that remotely controlled state-of-the-art receivers containing synthesized local oscillators may cost five to ten times more than the original cost of the receivers which they replace. To deal with the problem of escalating costs, general-purpose receivers that have several remote control options may be utilized to replace a variety of outdated receivers. The Watkins-Johnson CEI Division's WJ-8718 HF Receiver is one such receiver. The basic layout of the receiver is dominated by EMI requirements as well as convenient remote-control capability. Many of the economical aspects of the receiver were brought about not only by high volume production, but also by cost reductions in fabrication, assembly, testing, and material purchasing.

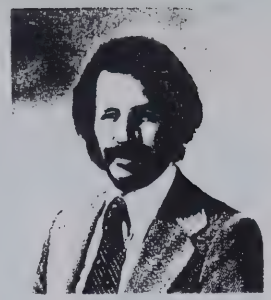
Authors:

Charles E. Dexter

Mr. Dexter is a member of the Watkins-Johnson CEI Division technical staff. He is the program manager for the WJ-8718 HF Receiver, which is a high-volume version of the WJ-8888 HF Receiver. Previously, Chuck was a member of the CEI Advanced Development Section, where his responsibilities included development of frequency synthesizer techniques designed to improve spectral purity and the production of more effective synthesizers.

Before joining the Advanced Development Section, Mr. Dexter was Head of the Frequency Counter and Synthesizer Group and was responsible for the design of frequency counters, frequency extenders, and surveillance receiving systems. Major design activities were directed toward designing frequency synthesizers and digital control of the WJ-8888 HF Receiver and frequency synthesizers for the WJ-9085 Tuner and the WJ-8940 EMI measuring system. The frequency range of these synthesized receivers range from 0.5 to 1000 MHz. Major products developed by Mr. Dexter's group include the DRO-280A and the DRO-309A Frequency Counters.

Mr. Dexter holds a B.S.E.T. degree in applied science from Capital Institute of Technology and is an associate member of IEEE.



Robert D. Glaz

Mr. Glaz is Head of the Watkins-Johnson CEI Division's HF Receiver Section. He is responsible for the initiation, development and production of all products within the HF range. The WJ-8718 and WJ-8888 are the major products in his product line.

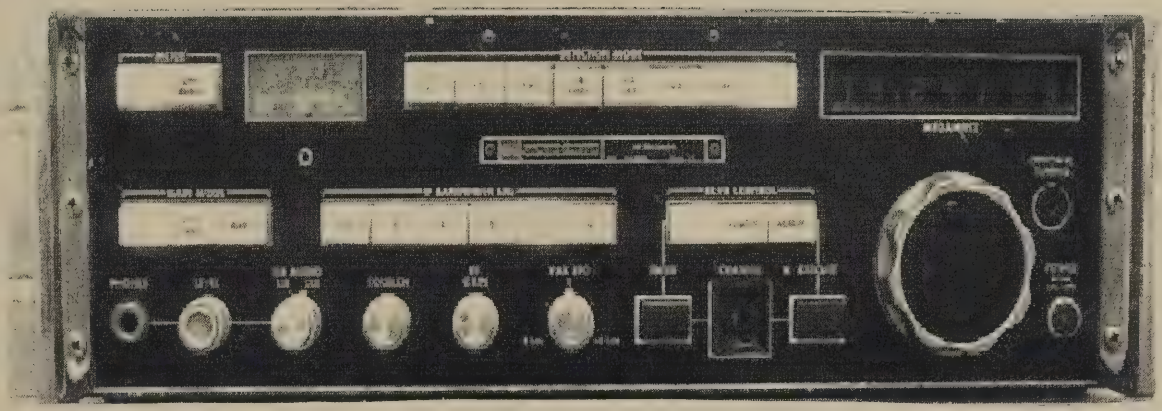
Since February, 1976, he has been the HF Product Line Manager, coordinating all activities within the division, to ensure the growth of the HF Receiving Section. His responsibilities in this area include proposals, marketing, budgets, schedules, product quality and costs.

From June, 1969 until September, 1973, when he assumed primary project responsibility for the WJ-8888, a state-of-the-art digitally-controlled HF receiver, Mr. Glaz was Head of the VHF/UHF Receiver Section. This section developed such standard catalog items as the WJ-8730 Receiver, the initial manpack receivers and the Type 565 VHF/UHF Receiver.

Prior to this, he served as a Senior Electronics Engineer specializing in receiver design and development. The RS-180 System, a miniature twelve channel VHF/UHF receiving system using a time-shared counter with DAFC was completed under his leadership. He was responsible for the development of a five-band, remotely-tuned, monopulse tuner system that operates from 150 MHz to 4 GHz and designed the tuners from 150 MHz to 1 GHz and the control units. He was also responsible for the design and development of manual VHF and UHF dual channel receivers for the FLR-12 system. Other development projects include wideband tuner development using nuvistors, bipolar and field-effect transistors, and special purpose surveillance receivers.

Mr. Glaz holds a B.S.E.E. degree from Polytechnic Institute of Brooklyn.

Tech-notes

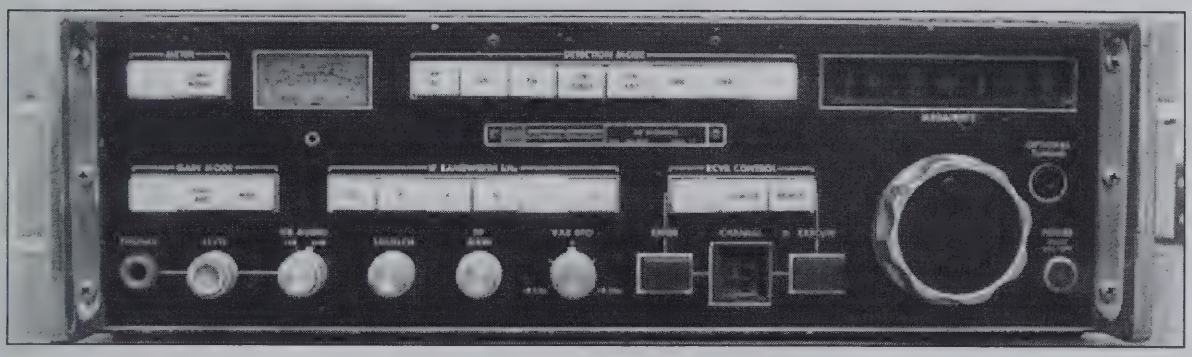


WJ-8888 Receiver

WATKINS-JOHNSON

WJ-8888 Receiver Series

back to home page



This receiver is a marvel of engineering. It is all discrete logic ICs, no microprocessor. Excellent specifications although getting from one end of the dial to the other is tedious. Three versions are known to exist, the plain, A and B. Substantial production differences and subtle feature differences exist between the three versions.

All versions of this receiver are scarce. The production numbers for the WJ-8718 series dwarf the number of "Quad 8" receivers that WJ made.

more to follow

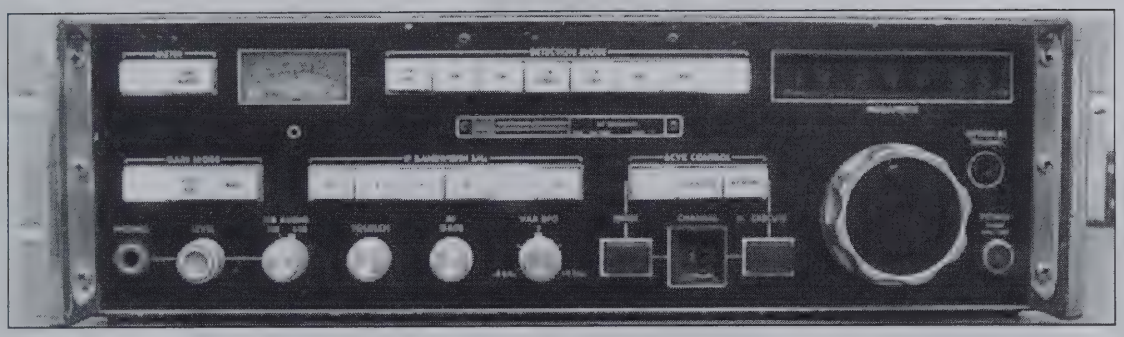
The WJ-8888 manual can be downloaded two places (both sites have it broken into many smaller chunks so a download manager like FlashGet is helpful):

Premium RX website under References

BAMA website - this one also has a mirror.

WJ-8888 Receiver Series

back to home page



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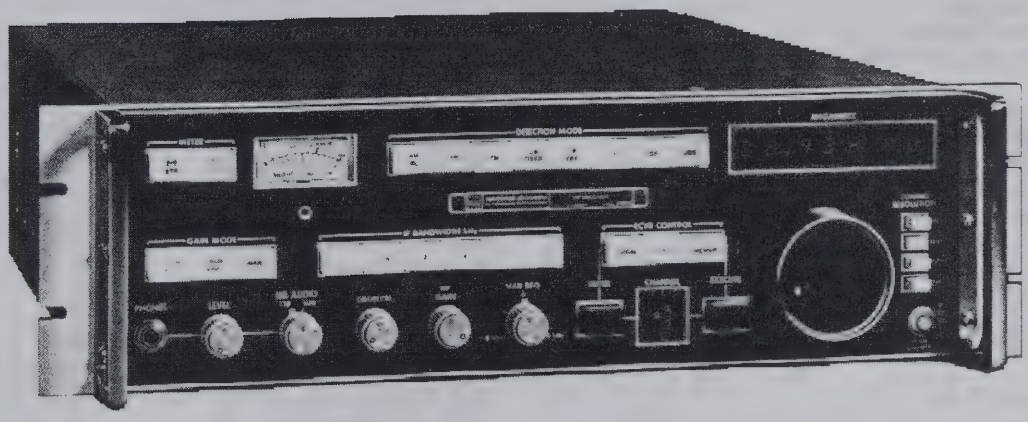
With compliments
Helmut Singer Elektronik
www.helmut-singer.com

WATKINS-JOHNSON

198.5

WJ-8888B HF RECEIVER



FEATURES

The WJ-8888B is a highly versatile HF receiver which provides exceptional signal handling capabilities over the frequency range of 500 kHz to 30 MHz. The receiver has three operating modes: Local, Remote and Memory. In the Local mode, the receiver is tuned manually by the operator. In the Remote mode, the receiver accepts and stores a digital word which controls the tuned frequency, detection mode, gain mode, IF bandwidth, RF gain level, and BFO frequency. In conjunction with the Local mode, the Memory mode enables the operator to store up to sixteen sets of receiver frequencies and control parameters, which may be recalled as required.

The receiver is designed for the reception of AM, FM, CW, ISB, LSB and USB emissions. Up to six IF bandwidths may be selected via front panel pushbutton switches. Four standard IF bandwidths of 0.5-, 2-, 4-, and 8-kHz are supplied with two IF bandwidths reserved for customer selection. The optional IF bandwidths are 0.2-, 1-, 3-, 6-, 12-, or 16-kHz. Each IF bandwidth filter is mounted on an individual plug-in card for simplified maintenance and changeover.

The WJ-8888B is supplied with four switch-selectable tuning speeds with resolutions of 10 Hz, 100 Hz, 1 kHz and 10 kHz. Other standard features include automatic switching of sub-octave preselection filters to minimize intermodulation distortion and synthesized local oscillators for maximum receiver stability.

The tuned frequency of the receiver is displayed on a front-panel seven-digit LED readout. Resolution of the display is 10 Hz over the entire tuning range. Three selectable gain control modes are provided: Manual, Normal AGC and Hold AGC. A meter on the front panel indicates relative signal strength or calibrated line audio output level. Front panel controls include: Main Tuning, RCVR Control, IF Bandwidth Select, Gain Mode Select, Detection Mode Select, RF Gain, ISB Audio Select, Audio Level, Squelch, Variable BFO Control and the four tuning resolution switches.

Variable audio output is available at a front-panel phone jack and balanced LSB, USB and Line Audio Outputs as well as the variable audio are available at a rear panel connector. An audio squelch circuit mutes the receiver audio output in the absence of incoming signals below the threshold set by the front panel Squelch Control. The receiver also provides a predetection IF output and a Signal Monitor output with a center frequency of 455 kHz. The 64-bit TTL-compatible I/O data is interfaced to the unit via connectors on the rear panel.

To enhance the receiver's versatility, a number of options are available in addition to the customer selected bandwidth options. The receiver may be ordered without the preselector sub-octave filters when the receiver is used in a low density environment or when preselection is accomplished by the associated antenna network. An optional logarithmic IF amplifier also is available.

The standard I/O interface module accepts the 64-bit serial synchronous data word. As a customer-selected option, transmission of the 64-bit data word can be serial

For Further Information Please Contact:

WATKINS-JOHNSON COMPANY

700 Quince Orchard Road, Gaithersburg, Maryland 20760
(301) 948-7550 TWX: 710-828-0546 Telex: 89-8402 Cable:WJCEI

Printed in U.S.A.

SEPTEMBER 1977

Supersedes Technical Data
Sheet 198.5 dated April 1976

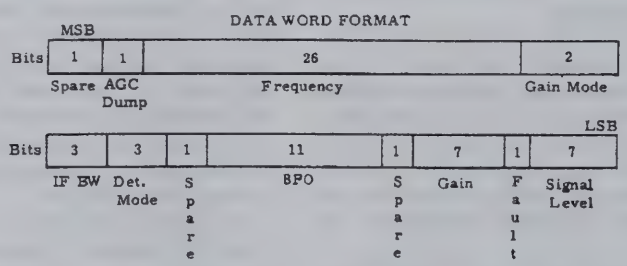
Specifications subject to change without notice.

asynchronous. In systems where master/slave or remote operation of receiver groups is desired, the remote/slave receivers can be supplied without front panel controls and frequency readout. The master/slave control is inherent in the optional serial asynchronous I/O module.

The WJ-8888B is designed for mounting in a standard 19-inch equipment rack and occupies 5.25 inches of vertical space. The standard unit operates on 115/220 Vac ±10%, 48-62 Hz; 400 Hz operation is available as an option.

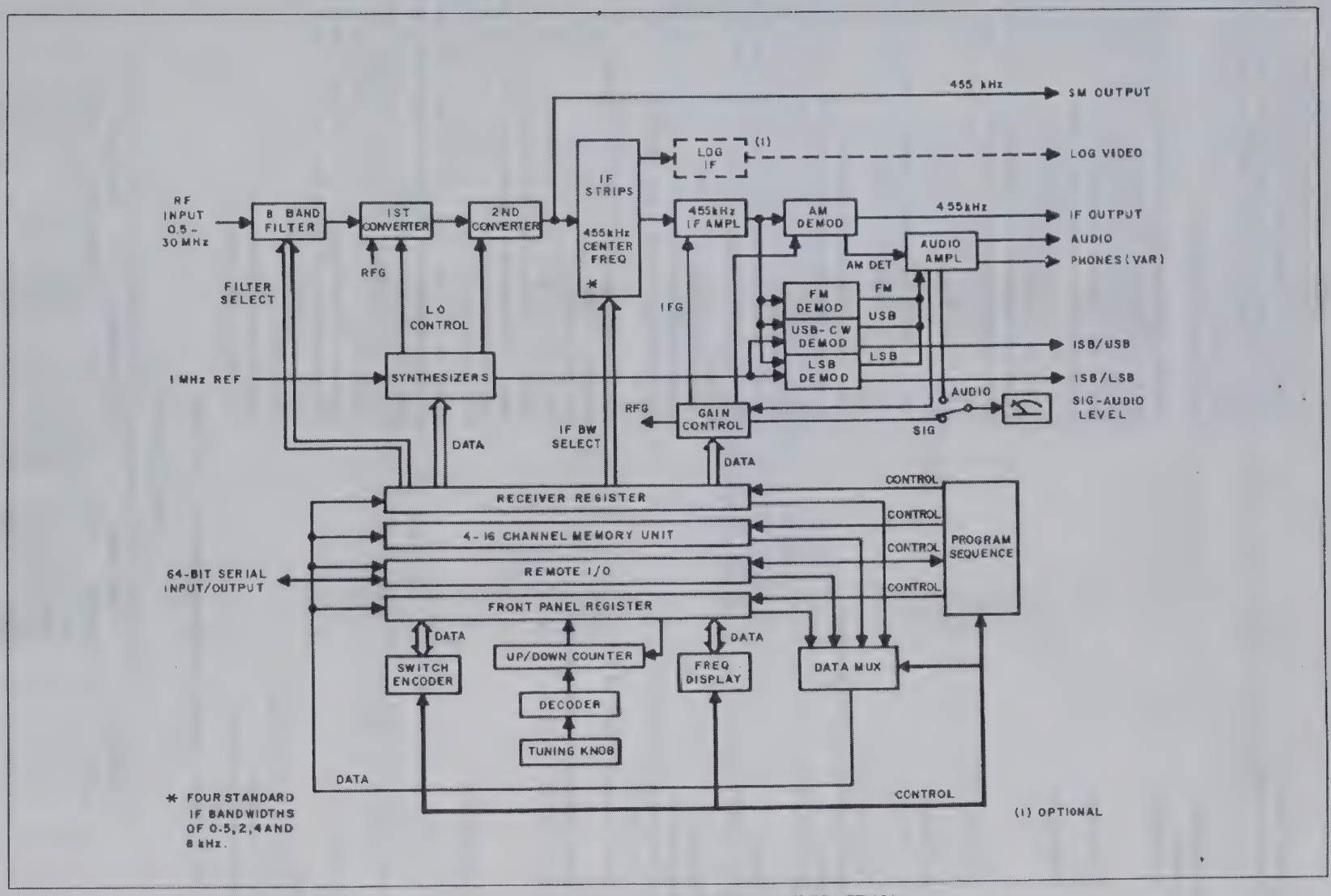
SPECIFICATIONS

Tuning Range	0.5 - 30 MHz
Tuning Resolution	10 Hz, 100 Hz, 1 kHz, 10 kHz; switch-selectable
Preselection	Sub-octave filters automatically switched
Input Impedance	50 ohms, unbalanced
Oscillator Radiation	10 μV or less at receiver input
Antenna Input Protection	The antenna input will withstand the effects of RF power to +15 dBm and static build-up. The protection circuit automatically resets.
IF Bandwidths (3 dB)	4 Bandwidths supplied, 6 positions available
Normally Supplied	0.5-, 2-, 4-, and 8-kHz
Optional	0.2-, 1-, 3-, 6-, 12-, or 16-kHz
IF Shape Factor (Typical)	IF BW — 50 dB:3 dB 0.2 kHz — 10:1 0.5 kHz — 7:1 1 kHz — 5:1 2 kHz — 3:1 16 kHz — 1.9:1 Filters with higher selectivity may be special ordered.
Detection Modes	AM Noise Limiter, AM, CW Fixed, CW Variable, USB, LSB, ISB, FM
Gain Control Modes	Manual, Normal AGC, Hold AGC
AGC and Manual Range	100 dB, minimum, for input signals above 2 μV
AGC Threshold	2.0 μV, minimum
AGC Attack Time	20 ms, nominal
AGC Release Time	Normal AGC, 0.1 seconds. Hold AGC, 2 seconds; both nominal.
Internally Generated Spurious	1 μV, maximum (equivalent input signal)
Tuning Speed (Remote)	5 ms, typical; 15 ms, maximum
Frequency Stability	6 x 10^{-8} per day, 2 x 10^{-6} per year
Standard Frequency Output	50 mV, minimum at 1 MHz into 50 ohms. Provision is made for an external 1 MHz standard.
Frequency Display	7 Digit, LED (dot matrix) display
Remote Control	Via Input/Output TTL serial synchronous differential pair, 64-bit word; formats as shown below:



Remote Control Interface:

Input Trigger	Differential pair, TTL strobe pulse, positive logic, 5 ms minimum pulse width; from controlling device to command receiver to supply clock signal for synchronous transfer of data.
Clock Input/Output	Two differential pairs, TTL clock train, 25 kHz, 10% duty cycle, square wave; effects serial data transfer to/from controller; may be OR wired.
Receiver Address	One differential pair, discrete, TTL level Logic 1 = receiver addressed Logic 0 = receiver not addressed



WJ-8888B RECEIVER - SIMPLIFIED BLOCK DIAGRAM

Memory Mode	Four channel memory capacity supplied. The entire 64-bit word is stored. Complete operating mode of the receiver may be internally stored and recalled later.
Optional Memory	Up to a total of sixteen channels in groups of four channels.
AC Power Interrupt	While the receiver is in the Local Mode, all the above functions are placed in a separate memory and reappear when power returns.
Control Modes	Local, Memory and Remote
Sensitivity:	
AM Sensitivity	The input signal levels specified in Table 1, 50% AM modulated at a 400-Hz rate will produce a 10 dB (S+N)/N ratio at the audio output (1 kHz and greater IF bandwidths).
CW Sensitivity	The CW input signal levels specified in Table 1, will produce a 16 dB (S+N)/N ratio at the audio output.
FM Sensitivity	The input signal levels specified in Table 1, FM modulated at a deviation equal to 30% of the IF bandwidth at a 400 Hz rate, will produce a 17 dB (S+N)/N ratio at the audio output (6 kHz and greater IF bandwidths).
LSB, USB, ISB	0.56 μV for 10 dB (S+N)/N or greater in 2.8 kHz bandwidth (8 kHz IF bandwidth also in use).
Audio Outputs:	
Line Audio	1 mW, minimum, transformer coupled, balanced into 600 ohms at 2.0 μV input level or greater.
Audio Distortion	Less than 5%
Audio Amplifier Frequency Response	Within 3 dB from 100 Hz to 15 kHz
Phones	10 mW, minimum into 600 ohms, front panel adjusted
ISB (LSB, USB)	Two, each provides 1 mW, minimum, transformer coupled, balanced, into 600 ohms at 0.56 μV input level
IF Output	455 kHz, 50 mV, minimum, at 2 μV input level or greater
Signal Monitor Output	455 kHz center frequency, bandwidth limited by first IF filter
IF Rejection	Greater than 100 dB
Image Rejection	Greater than 100 dB
Unwanted Sideband Rejection	50 dB at 350 Hz into unwanted sideband
Intermodulation:	
Third Order Input Intercept Point	+20 dBm, minimum, for the undesired signals separated by more than 50 kHz
Second Order Input Intercept Point	+60 dBm, minimum
Reciprocal Mixing	With a desired signal of 25 microvolts, in the 2 kHz IF bandwidth, the desired signal to noise ratio will be greater than 20 dB, when an undesired signal 70 dB higher in amplitude and removed 30 kHz in frequency is present.
Cross Modulation	With desired signal at 50 μV, an undesired signal at 50 mV greater than 50 kHz away, AM modulated 50% produces an output at least 20 dB below the output level of desired signal in the 2 kHz IF bandwidth.
Non-Remote Control Functions	Phone level, squelch, memory channel select and RF/Audio Meter
Signal Meter	Indicates RF input signal level or line audio output level
Size	19 inches wide, 5.25 inches high, and 19.5 inches deep
Weight	Approximately 40 pounds
Operating Temperature Range*	0°C to 50°C
Power Consumption	Approximately 0.8 amps at 115 Vac
Input Power Requirements	115/220 Vac ±10%, 48-62 Hz

*Operation within published specifications guaranteed at 25°C ±5°C.

TABLE 1. SENSITIVITY

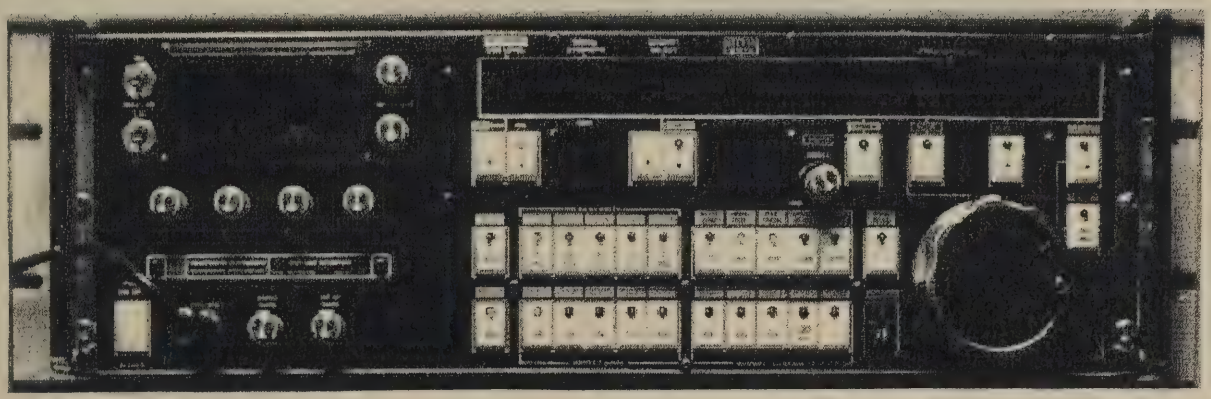
IF Bandwidth kHz	Input Level Microvolts	dBm	IF Bandwidth kHz	Input Level Microvolts	dBm
0.2	0.40	−115.5	4.0	1.3	−105
0.5	0.45	−114	6.0	1.7	−102.5
1.0	0.64	−111	8.0	1.8	−102
2.0	0.89	−108	12.0	2.4	−99.5
3.0	1.2	−105.5	16.0	2.5	−99

WJ-8716 and WJ-8718 Receiver Option 06-03-04

232	RS-232 I/O remote control
232M	RS-232 I/O for MFP option
488-2	IEEE-488 I/O remote control
488M	IEEE-488 I/O for MFP option
B10	10 Hz BFO tuning
COM	command input module
COR	carrier operated relay
DDC	dual diversity combiner
EM	extended memory (100 channels)
FSK	frequency shift keying
GRN	green LED display
ISB	independent sideband
LLA	low level audio output
MCM	manual control module (standard front panel)
MCM-2	manual control module (difference from MCM unknown)
MFP	microprocessor front panel (extensive - radically alters appearance)
MFS	mainframe spares module
MON	status monitor module
NAV	Navy option (alters front panel)
PRE	preselector
RED	red LED display
SMO	spectrum monitor output
TK	tool kit
1HZ	one hertz tuning rate

Note: The differences between an 8716 an 8718 are minor. The 8716 is rumored to be the Tempest version (EMI hardened) but examination of several units has revealed only minor differences in shielding and filtering on four rear panel connectors.

Tech-notes



WJ-8617 receivers

WATKINS-JOHNSON

WJ-8617 receivers

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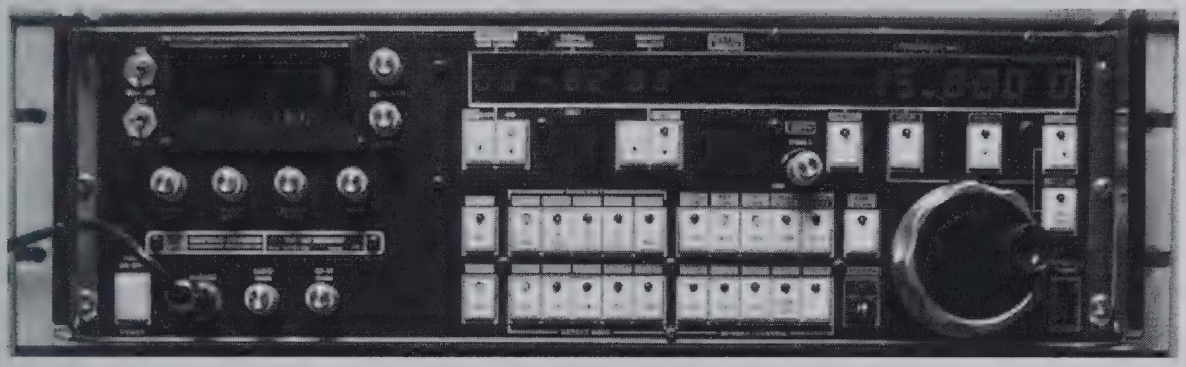
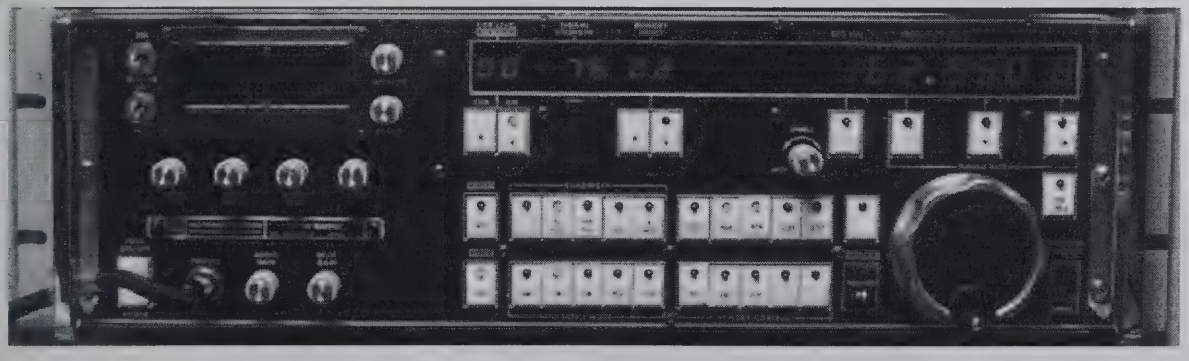
The WJ-8617 (and WJ-8618) are one of the more successful and relatively common WJ VHF-UHF receivers. They were produced in a bewildering array of versions with many different options. It is very difficult to know what you are getting when you buy one of these radios unless you know them well and do a thorough external and internal inspection. The radios have a flexible architecture and were often reconfigured in the field. Caveat emptor!



This is a WJ-8617B-26. It is a special modification of the late model S1 series with an upconverter allowing coverage from 10 kHz to 500 Mhz. Most WJ-8617 (and 8618) receivers were VHF/UHF radios covering 20-500 MHz in basic form. This radio offers great performance throughout the 10 kHz to 500 MHz range. It has bandwidths of 3.2U, 3.2L, 6.4, 10, 20, 50, 250 kHz (2 MHz was installed instead of 250 kHz when this picture was taken)



This is a WJ-8617B-17. This is an S1 series radio. It has an LNA instead of a antenna switch at the input stage. It came stock with the FE option, raising the top end of reception to 1100 MHz. This one has the synthesizer EPROM changed to allow it to tune to down to DC. This radio is a hot receiver in VHF/UHF service but overloads so badly below 30 MHz that it is unusable. This radio has bandwidths of 50 & 250 kHz, 1 & 4 MHz (shown). I changed it to 20, 50, 200 & 500 kHz, 1 MHz and added the SSB option card with 3.2U and 3.2L kHz bandwidths.

These two radios have very different capabilities but to the untrained eye, they appear identical. The WJ-8617B-17 is the only version that offers excellent VLF/LF/HF functionality. Many versions could tune down to

2 MHz (HFE option) or DC (LFE option) but these offered no input filtering or in some cases, only a 30 MHz low pass filter when tuned below 20 MHz. The WJ-8617B-26 was the only version with the LNA front end. The basic chassis supports either version but their main features cannot coexist in the same radio. The VLF convertor in the -26 occupies the same slot as the FE option in the -17.

More to follow

configuration guide - entire series

available options

S1 version configuration switches - see S1 versions in the configuration guide to learn how to test your radio for S1 and version numbers

Pluggable Keypad Controller (PKC) schematic - an easy to build circuit that adds keypad frequency entry to these radios. Plugs into 10 pin IDC connector just to the lower left of the main tuning knob.

Watkins-Johnson Radio Systems

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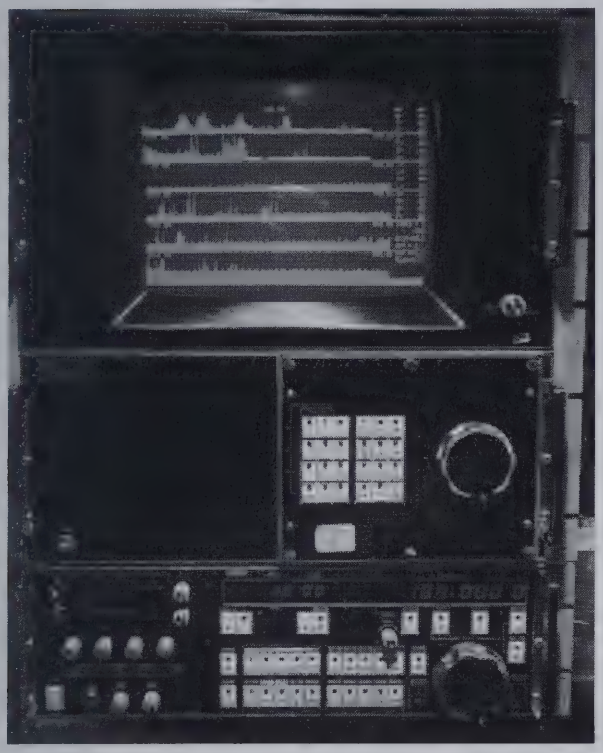
Receiving systems basic information guide for CEI and WJ



WJ-9195 Rapid Acquisition Spectrum Processor.

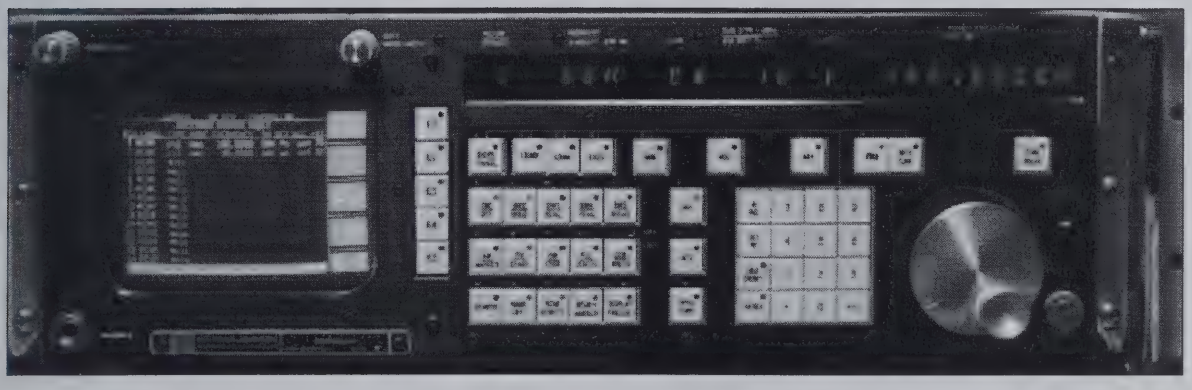
Consists of:

-WJ-9195/DRD-1 - Digitally Refreshed Display - functions as scan controller and processor for a specially adapted WJ-8617B receiver.

-WJ-9195/CRT - standard NTSC display monitor in slick WJ cabinet

-WJ-8617B-2 or WJ-8618B-15 (shown) - specially modified WJ-8617B receivers for rapid spectrum scanning. See WJ-8617 or WJ-8618 pages for more details

more to follow



WJ-8610A Multiple receiver controller

WJ-8610A is designed to control up to 14 receivers via IEEE-488.

WJ-8610 Receiver Controller

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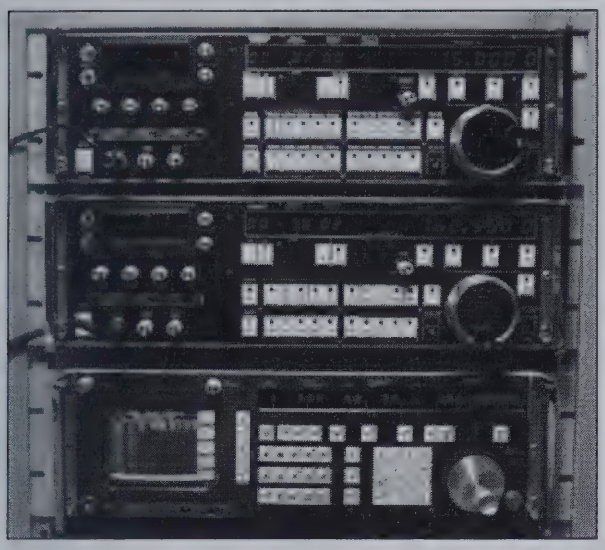


A WJ-8610A-1 is shown here controlling two WJ-8617B(S1) radios (a -17 and a -26).

Four receivers can have audio routed through the WJ-8610A for monitoring. Designed to control WJ-8617B or later, WJ-8618B or later and any of the WJ-8615 and WJ-8619 series.

It works best with WJ-8615 receivers that have the Scan-Step-Lockout (SSL) option. When used with SSL receivers, an NTSC video terminal can be attached to the WJ-8610A and will show spectrum displays from several receivers simultaneously.

WJ-8610A catalog page includes information a "Responsive Suveillance Subsystem" featuring four WJ-8615 receivers, WJ-9205 SDU and other components.

WJ-8610A operating screens

WJ-8610A keyboard and display

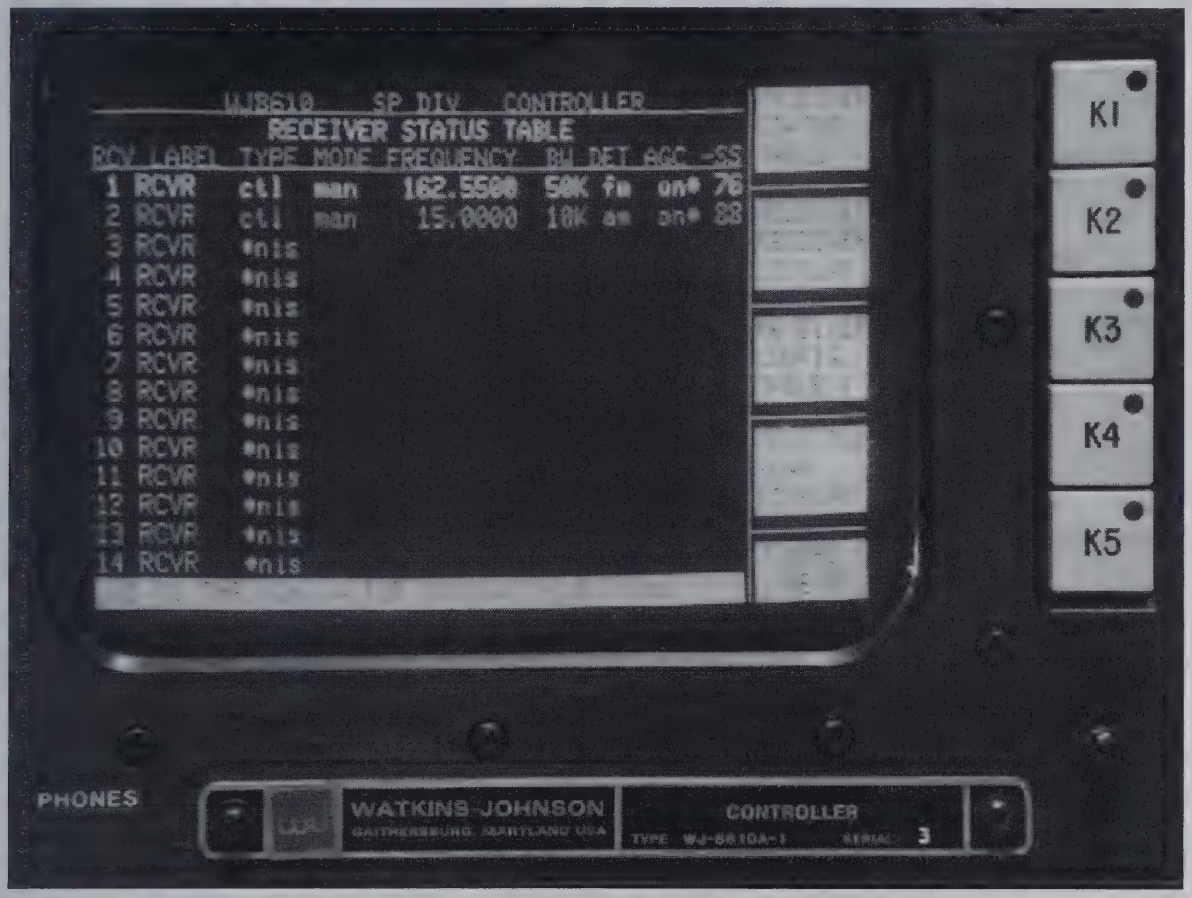
WJ-8610A-1 circuit board pictures for setup and troubleshooting

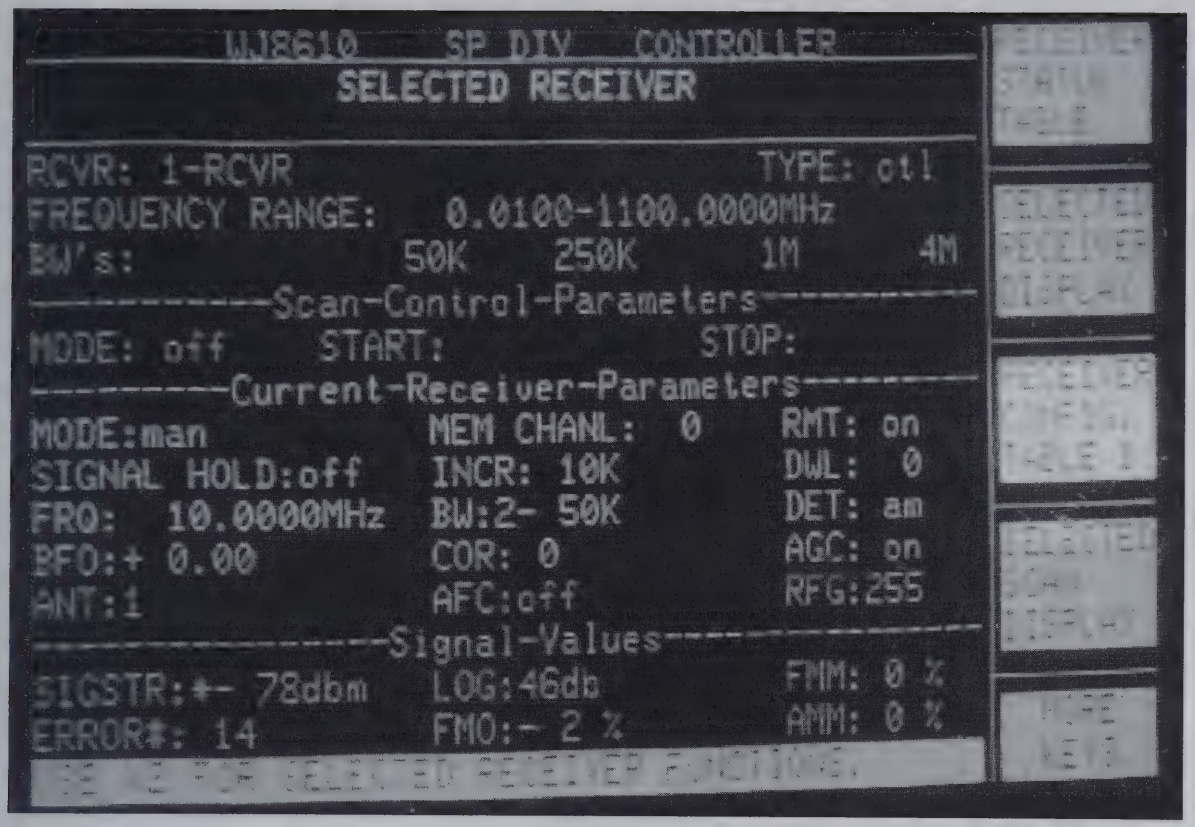
more to follow

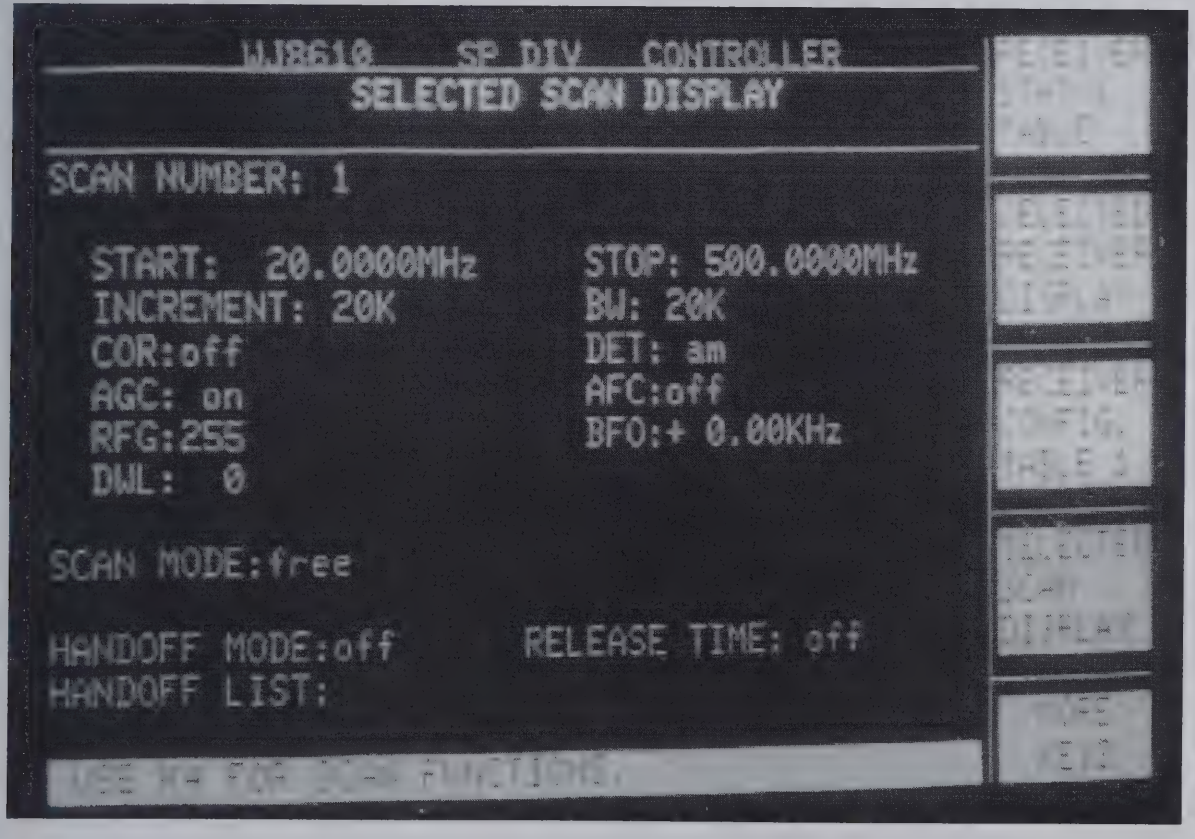
WJ-8610A Operating Screens

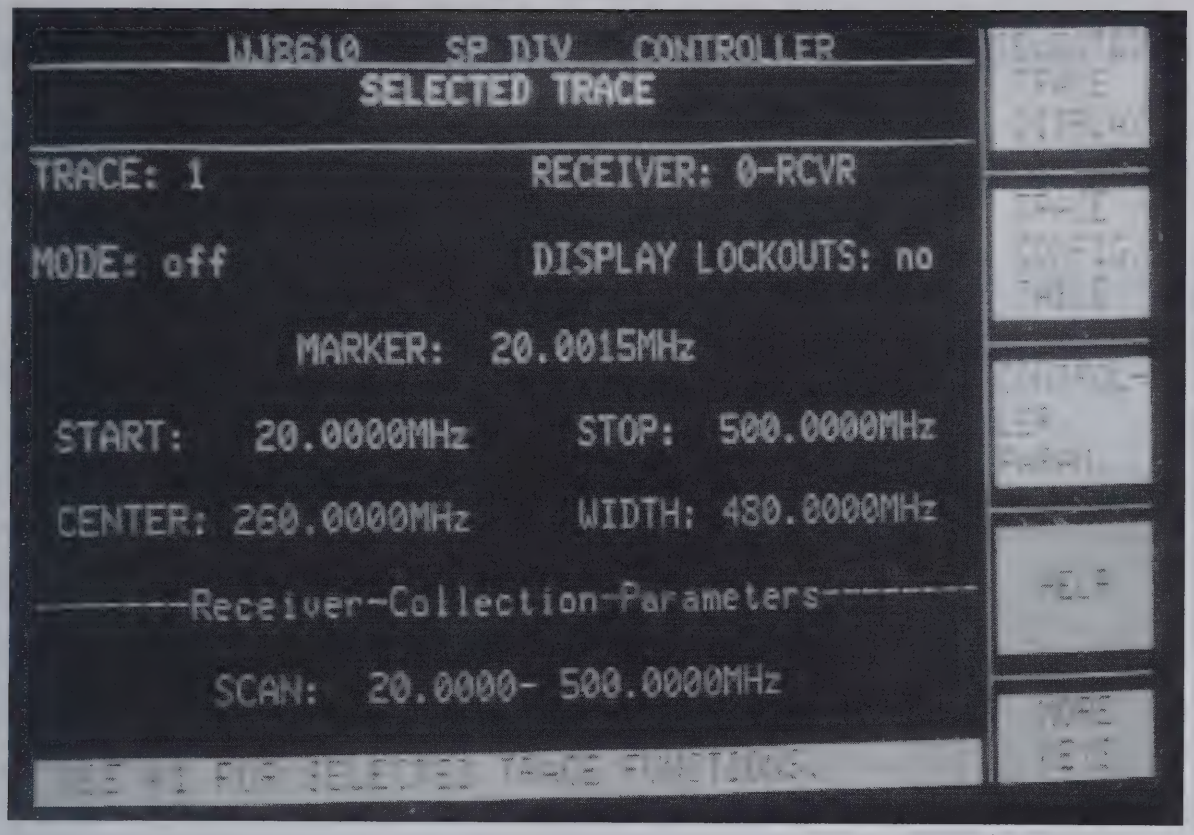
back to main page

The following are a sample of the control screens displayed on the WJ-8610A. There are many more. There are also spectrum displays on the NTSC video output that show scan results for up to four receivers. The WJ-8610 offers and incredible amount of visual information about the connected receivers.




WJ8610 SP DIV CONTROLLER
SELECTED RECEIVER
RCVR: 1-RCVR
TYPE: otl
FREQUENCY RANGE: 0.0100-1100.0000MHz
BW's: 50K 250K 1M 4M
Scan-Control-Parameters
MODE: off START: STOP:
Current-Receiver-Parameters
MODE:man
MEM CHANL: 0
RMT: on
SIGNAL HOLD:off
INCR: 10K
DWL: 0
FRQ: 10.0000MHz
BW:2- 50K
DET: am
BFO:+ 0.00
COR: 0
AGC: on
ANT:1
AFC:off
RFG:255
Signal-Values
SIGSTR:+- 78dbm
LOG:46db
FMM: 0 %
ERROR#: 14
FMO:- 2 %
AMM: 0 %


WJ8610 SP DIV CONTROLLER
SELECTED SCAN DISPLAY
SCAN NUMBER: 1
START: 20.0000MHz
STOP: 500.0000MHz
INCREMENT: 20K
BW: 20K
COR:off
DET: am
AGC: on
AFC:off
RFG:255
BFO:+ 0.00KHz
DWL: 0
SCAN MODE:free
HANDOFF MODE:off
RELEASE TIME: off
HANDOFF LIST:


WJ8610 SP DIV CONTROLLER
SELECTED TRACE
TRACE: 1
RECEIVER: 0-RCVR
MODE: off
DISPLAY LOCKOUTS: no
MARKER: 20.0015MHz
START: 20.0000MHz
STOP: 500.0000MHz
CENTER: 260.0000MHz
WIDTH: 480.0000MHz
Receiver-Collection-Parameters
SCAN: 20.0000- 500.0000MHz

WJ-8610 Keyboards and LED Display

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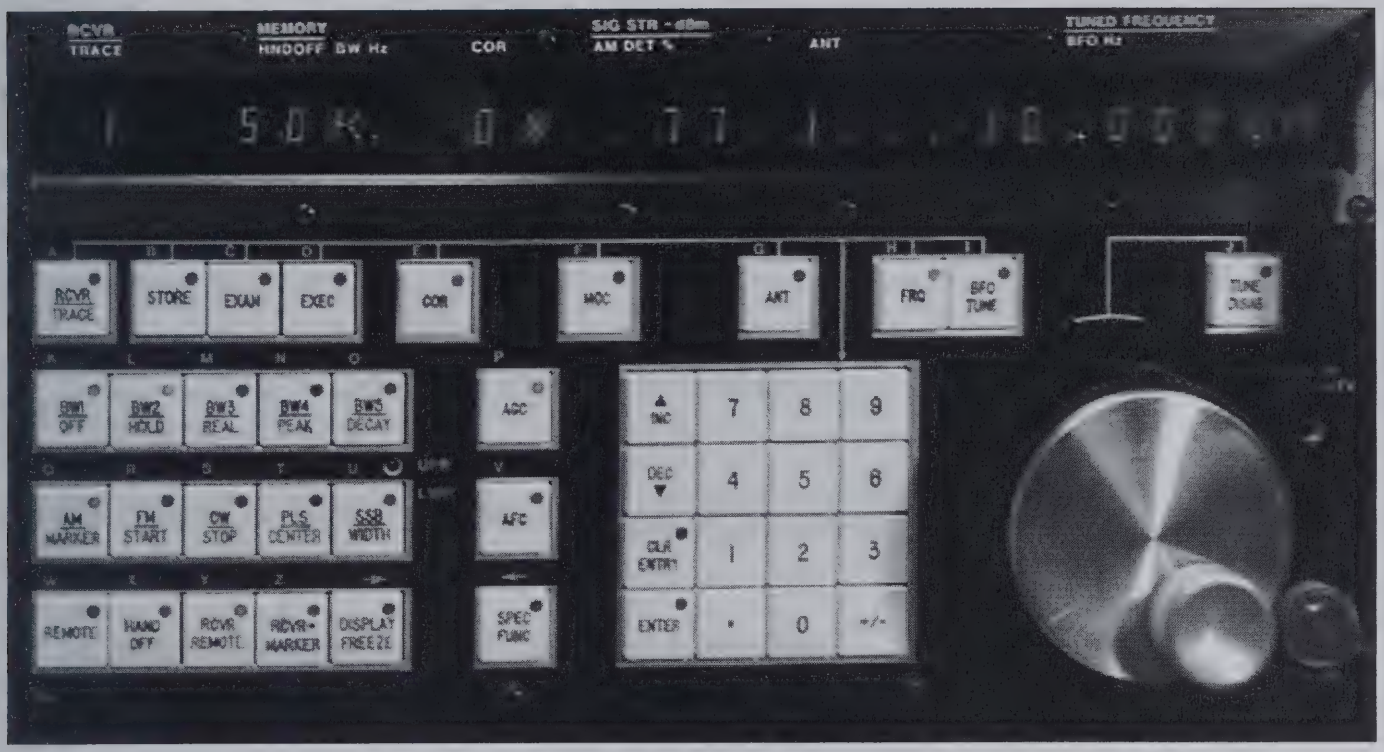
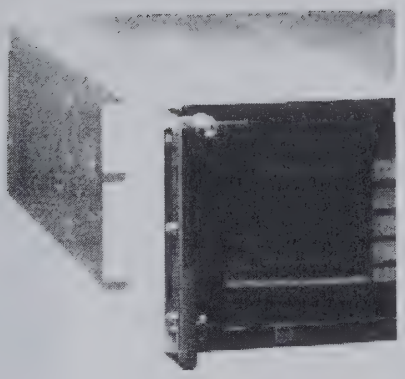


- **Dedicated Controller for WJ-861X Family Receivers**
- **Functions As Central Controller or Command Distribution Point**
- **Simultaneous Status Display for Up to Fourteen Receivers**
- **99 Channel Memory for Storage of Complete Receiver Setups**
- **Microprocessor Based Control Circuitry**
- **IEEE-488 Interface for Receivers and External Computer**



The WJ-8610A Controller is the center for multiple receiver systems utilizing WJ-861X Receivers. Its front panel provides local control of each receiver in the system and has the capability of interfacing with an external system computer for remote computer-controlled operation. The front panel has all of the controls and indicators necessary for total control of each receiver in the system. It displays a continuous status of up to 14 receivers simultaneously and permits control to be exercised over any receiver as required. A 99-channel non-volatile memory, contained in the controller, is capable of storing complete receiver setups. This memory scratch pad memory used receiver setting of transferring data f

When operated in tem computer, the V as an interface bus e bution point. It receiv puter and directs receiver in the syste receivers is then mai mitting the computer the status of any rec figuration minimizes freeing the computer

This controller ca plex systems' requi demodulators.

WJ-8617 receivers

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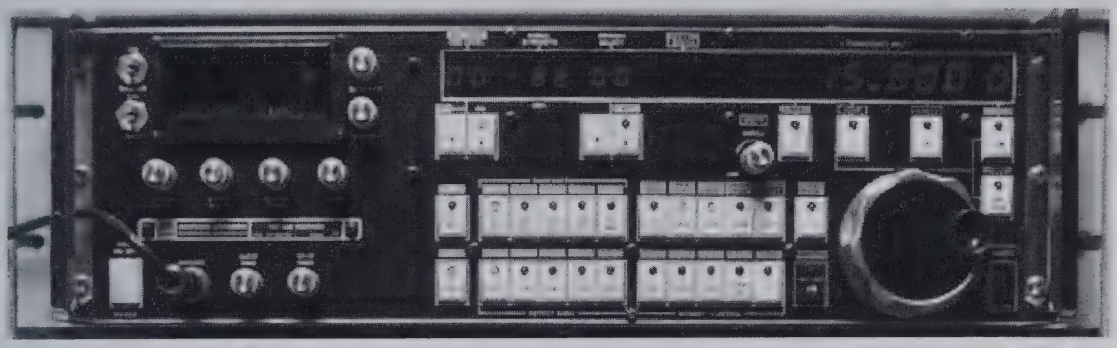
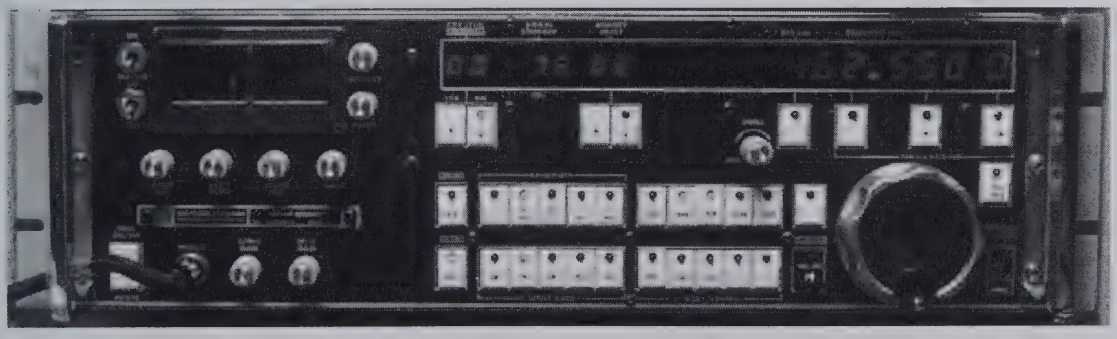
The WJ-8617 (and WJ-8618) are one of the more successful and relatively common WJ VHF-UHF receivers. They were produced in a bewildering array of versions with many different options. It is very difficult to know what you are getting when you buy one of these radios unless you know them well and do a thorough external and internal inspection. The radios have a flexible architecture and were often reconfigured in the field. Caveat emptor!



This is a WJ-8617B-26. It is a special modification of the late model S1 series with an upconverter allowing coverage from 10 kHz to 500 Mhz. Most WJ-8617 (and 8618) receivers were VHF/UHF radios covering 20-500 MHz in basic form. This radio offers great performance throughout the 10 kHz to 500 MHz range. It has bandwidths of 3.2U, 3.2L, 6.4, 10, 20, 50, 250 kHz (2 MHz was installed instead of 250 kHz when this picture was taken)



This is a WJ-8617B-17. This is an S1 series radio. It has an LNA instead of a antenna switch at the input stage. It came stock with the FE option, raising the top end of reception to 1100 MHz. This one has the synthesizer EPROM changed to allow it to tune to down to DC. This radio is a hot receiver in VHF/UHF service but overloads so badly below 30 MHz that it is unusable. This radio has bandwidths of 50 & 250 kHz, 1 & 4 MHz (shown). I changed it to 20, 50, 200 & 500 kHz, 1 MHz and added the SSB option card with 3.2U and 3.2L kHz bandwidths.

These two radios have very different capabilities but to the untrained eye, they appear identical. The WJ-8617B-17 is the only version that offers excellent VLF/LF/HF functionality. Many versions could tune down to 2 MHz (HFE option) or DC (LFE option) but these offered no input filtering or in some cases, only a 30 MHz low pass filter when tuned below 20 MHz. The WJ-8617B-26 was the only version with the LNA front end.

The basic chassis supports either version but their main features cannot coexist in the same radio. The VLF convertor in the -26 occupies the same slot as the FE option in the -17.

More to follow

configuration guide - entire series

available options

S1 version configuration switches - see S1 versions in the configuration guide to learn how to test your radio for S1 and version numbers

Pluggable Keypad Controller (PKC) schematic - an easy to build circuit that adds keypad frequency entry to these radios. Plugs into 10 pin IDC connector just to the lower left of the main tuning knob.

WJ-861x Receiver Options

06-03-04

The WJ-8615, WJ-8617 and WJ-8618 receivers vary wildly in configuration, options, and coverage. The codes are the same for all receivers but the options themselves require different boards and, in some cases, different software versions for different radios.

Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

10IF	Ten IF (receiver has ten slots for IFs and Demods 8617-8618 only)
10MHz	10 MHz maximum IF bandwidth (8 MHz is standard)
150Hz	150Hz tone sensing squelch (for military VHF use)
232	RS-232 Remote Control Interface
488	IEEE-488 Remote Control Interface
ASO	Audio Scan Output (audio output tone locked to received frequency)
BITE	Built In Test Equipment (2 versions, one with RF, one w/o)
CUR	Cursor (tuning knob moves cursor over spectrum display to show frequency)
DAV	Digital Audio Video (set audio and video output levels by digit control)
DFC	Direction Finder Control (for use with WJ-8971A direction finding unit)
DRD	Digitally Refreshed Display
EM	Extended Memory (96 channels - standard issue is 16)
FE	Frequency Extender (to 1.1 GHz)
FEX	Frequency Extender (to 1.2 GHz)
FP	Fan attachment (adds 2 muffin fans to rear and 3" to depth of radio)
HFE	High Frequency Extender (down to HF frequencies of 2 MHz)
IFBW	IF Bandwidth & discriminator sets (designation for any special IF/demods ordered)
ISB	Independent Sideband
LFE	Low Frequency Extender (down to LF frequencies of 100 kHz)
LOC	Lockout (allows locking out memories during scan)
LOGV	60 dB Log Video
M/S	Master/Slave (allows remote control by or of other radios)
NRT	Noise Riding Threshold (specialized squelch)
PAS	Programmable Antenna Switch (use tuning knob to set frequency in memory for automatic switchover of antennas)
PKC	Pluggable Keyboard Control (almost standard on 8617-8618 - look for IDC jack by tuning knob)
PRE	Preselector (** details not known **)
PSM	Panoramic/Sector Marker Display
PSS	** details not known **
RLOG	Record Logging
RCS	Rotating Chassis Slides (for rolling out of a rack and rotating for servicing)

RTC	Real Time Clock
SCS	Straight Chassis Slides (for rolling out of a rack mount)
SM	Spectrum Monitor (usually standard, the display on the front panel)
SMO	Spectrum Monitor Output (21.4 MHz)
SSB	Single Sideband Demodulator (USB and LSB w/ 3.2 kHz filters)
SSL	Sacn/Step/Lockout (advanced scanning features for 8615 only)
TPC	** details not known ***
TUN	Tuning (allows tuning by flashing display digit or standard 100Hz/10kHz/1MHz)
VBFO	Variable Beat Frequency Oscillator
VLF	Very Low Frequency (covers 10kHz-500MHz - has a built-in downconverter activated below 6 MHz - cannot be installed with FE or FEX)
WBO	Wide Band Output (10MHz wide @ 21.4MHz for external demods)
WBO2	Wide Band Output 2 **details not known**

WJ-8617, 8617A, 8617B & 8617B(S1) Receiver Configurations

06-03-04

The version number is rarely printed on the front panel. It is occasionally printed or handwritten on the rear panel option sticker. Sometimes it is written on the window cover of the microprocessor card EPROMs. These dash numbers appear to be more of an internal WJ code for designating the starting point in meeting a customers needs.

WJ-8617 receivers vary wildly in configuration, options, and coverage. Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

WJ-8617 Series

WJ-8617 Status = M 5/4/77
General purpose VHF/UHF receiver with 20 - 1000 MHz coverage. Synthesized, digitally controlled receiver with built-in signal monitor.

WJ-8617-2 Status = M 1/18/80
20 - 1100 MHz remotely controlled receiver. AM, FM, and CW reception. Voltage tuned preselectors (20% BW). Noise figure 20 - 500 MHZ is 9 dB typical, 500 - 1100 MHz is 10 dB typical. Internal signal monitor data over 20 Hz - 20 kHz line. Control data received 300 - 2800 Hz. 600 Ohm video output. 6 RF inputs.

WJ-8617A Series

WJ-8617A Status= 1980
General purpose receiver. Digitally controlled. With VHF/UHF range of 20-1100 MHz

WJ-8617A-1 Status = M 8/14/80
Same as WJ-8617A without signal monitor. (Bruff)

WJ-8617A-3 Status= M 8/14/80
WJ-8617A with blank front panel. This is for remote control. Unit must have IEEE-488 or RS-232C interface option.

WJ-8617A-4 STATUS = M 8/15/80
WJ-8617A with signal monitor deleted. AGC threshold detector of 30 dB (-1 +2 dB).

Analog AGC outptut. Wideband IF output of -13 to -33 dBm. FM detector accuracy to ithin 3% of straight line over 80% of the IF bandwidth. Antenna switch.

WJ-8617B Series

WJ-8617B Status= 11/2/83
Frequency range 20 - 500 MHz (1100 MHz with FE option) Fully synthesized. 100 Hz tuning resolution. Sythesizer settling time 3 mS. AM, FM, CW & PULSE detection modes (SSB, LOG optional). LOG/LIN signal monitor. Low RFI design meets MIL-STD-461A. Five selectable IF bandwidths (many available options). Modular construction. Built for low mean time to repair (MTTR).

WJ-8617B-1 Status = M 4/82
For customer *****. Modified WJ-827B for TCAS. Contains software changes that modify operation of dwell control and adds capability of manual logging and operating a real-time clock. Unique front panel. Software version must be less than v2.2. See file for list of options installed as standard.

WJ-8617B-2 Status = M 3/26/82
Fast acquisition receiver. Designed to scan 1 MHz increments with settings: step size = 1 MHz; dwell = 0. Front panel will be blank. DRD display may not use entire SDU screen. Non-MHz digits in the memory channels will be ignored. Scan time will be 50 mS. See file for complete details.

WJ-8617B-3 Status=
Same WJ-8617B except 794190-1 front panel display and controls sub-assembly replaced with WJ-8617B-3FP front panel. WJ-8617B-3FP contains on/off switch, power indicator, phone jack, and audio level control. Radio to be remote controlled from external device via IEEE-488 remote interface.

WJ-8617B-4 Status= 4/82
Modified WJ-8617B with IF bandwidths of 10, 20, 50, and 100 KHz. "B" version Karakal receiver with NRT. Special designation for scan, step, lock out, etc. Options included: EM, DRD, IEEE-488, LOC, H/O, and M/S.

WJ-8617B-5 Status= 3/1/83
The units are being developed for the TRQ-32 program. Special functions are: 1) 150 Hz recognition - with 150 Hz, without 150 Hz, and all signals. 2) Bandwidth output data - remote indication of active bandwidth. 3) Low frequency extension 0.5 - 20 MHz. 4) IF bandwidth of 3.2 kHz. (Bruff/Deeb)

WJ-8617B-5 Rev. 1: 1/89

Updates standard equipment included in WJ-8617B-5 unit. Signal monitor, Digital refreshed display, Single sideband, IEEE-488 interface bus. IF BWs for WJ-8617B-5, IF amplifiers for 3.2 KHz, 10 KHz, and 50 KHz, FM demodulators for 3.2 KHz, 10 KHz, and 50 KHz.

WJ-8617B-6 Status = p 4/29/83
This is a contract item for ***** Associates. Options installed: 488, SSB. IF BWs: 10 KHz, 25 KHz. see file for special requirements installed.

WJ-8617B-7 Status = M 5/13/83
***** Associates unit. Options installed: 488, SSB. IF BWs: 10 KHz, 25 KHz. See file for special requirements installed.

WJ-8617B-8 Status=
Feldspar receiver. Front panel light green. Tuning range of 10 KHz-500 MHz (VLF converter option). Video output level control on front panel with DAV and concentric audio control for front and rear panel output level. WBO option, but with 10.7 MHz center frequency (BW at least 8 MHz). AM detector dynamic range of 45dB minimum. With IF BW not greater than 50 KHz. Frequency offset can be entered via front panel or IEEE-488 bus. Disabled AGC ahead of SM. Positive video output. IF BW options not less than 300 KHz limited to the following (in KHz): 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 3200, 4000.

WJ-8617B-8 Rev 2:
EM option required.

WJ-8617B-8 Rev 3:
SSB option supported.

WJ-8617B-9 Status= 8/84
Similar to WJ-8617B except has different standard features: RS-232 remote interface; real-time clock; 1st and 2nd LO outputs are provided. FE LO output provided when installed. Type 796233-4 audio/video COR board replaces standard audio/video COR board. Three-step AFC feature replaces the the standard AFC. Software modified to function with WJ-8976 DF processor. Options supported: TUN, MS, FE, SSB, SM, LOGV, HFE, LFE, RTC. Consult engineering on options: VLF, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, WBO, ASO, NRT, DFC, IFBW, 10MHZ, PRE, TPC.

WJ-8617B-9 Rev. 1 9/12/86
Differences not known.

WJ-8617B-10 Status= 11/83
Same as WJ-8617B except: Special "dump" front panel with dump memory channel, load memory channel, and clear memory channel. Storage allocations fixed: channels 0-47 for

step and scan frequencies; channles 48-63 for sweep scan frequencies; and channels 64-95 for lockout frequencies.

WJ-8617B-11 Status= 11/83
Same as WJ-8617B except special synthesizer of 5, 110, and 30 ms settling times. Optimized control software for receiver processor steps and scans and dwell periods. Wideband IF and mode query.

WJ-8617B-12 Status= 3/5/84
(Configuration 5, DF box). Software modifications: 1) Combine box special software (WJ-8617B-10) and utilize LO master/slave (WJ-8617B-6); 2) Support fully functional front panel and SM, LOC, CUR, 488, 10, 20, 50 mS. Hardware modifications: 1) Rear panel identical to WJ-8617B-6. No front panel bezel change; 2) Add LO modules. See type number card.

WJ-8617B-13 Status= 3/5/84
(Configuration 5, DF box). Software same as WJ-8617B-12. Hardware reconfigured as follows: 1) remove A3A8 through A3A21 modules; A4A1 through A4A6 modules; A4 motherboard. Uses 8617B-3 front panel. New nameplate. Create new mainframe plate and schematic. Add 488 option only. Add 2nd LO amplifier. See type number card.

WJ-8617B-14 Status= 7/84
Similar to WJ-8617B with modified software to bias the display frequency with respect to the actual frequency. Units will have 10 IF BWs and buttons. New name plate. Generate CPL.

WJ-8617B-15 Status= 9/84
Same as WJ-8617B except that the IF output on the rear panel is provided through a BNC rather than a TNC connector.

WJ-8617B-16 Status= 10/84
WJ-8617B modified to provide noise figure of less than 6 dB. Decade tuning (TUN) and10 IF bandwidths standard. Designed for narrowband tempest testing.

WJ-8617B(S1) Series

WJ-8617B(S1) Status= 4/85
New microproccesor card uses MC6809 processor. Not backward compatible with old units. Most options supported in microprocessor board ROMs rather than on option card ROMs (latest major software upgrades).

WJ-8617B(SI)-3 Status= 6/25/85

Sames as the WJ-8617B-3 except has new microprocessor board (WJ type 796353-2) installed. New board will improve RS-232 interface and communication.

WJ-8617B-17 Status= 10/84
Same as WJ-8617B(S1) but with low noise amplifier instead of antenna switch. Antenna 1 input is dedicated to 0.5 - 500 MHz and antenna 2 is dedicated to 500 - 1100 MHz input. The noise figure is typically 4 dB in VHF and 6 dB in UHF.

WJ-8617B-17 Rev. 1 2/87
Differences not known.

WJ-8617B-17 Rev. 2 1/89
Adds FE and SM as standard options.

WJ-8617B-18 Status=
Design per ***** specifications (see file). Front panel with green LEDs. Tuning range of 10KHz-500MHz (VLF converter). Video output level control on front panel with DAV option and concentric audio control for front & rear panel output level. WBO, but with 10.7 MHz center frequency (BW at least 8 MHz). AM detector dynamic range of 45 dB minimum with IF BW not greater than 50 KHz. frequency offset can be entered via front panel or RS-232 interface. Disable AGC ahead of spectrum monito. Positive video. IF BWs not less than 300KHz limited to the following selections (KHZ): 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 3200, 4000.

WJ-8617B-18 Rev. 1
EM is required option

WJ-8617B-18 Rev. 2
SSB option is supported.

WJ-8617B-19 Status= 6/25/85
Controls WJ-8617B(SI)-3 through RS-232 communication link in normal mode. Same as WJ-8617B in master/slave. Sends out tuned frequency, antenna select, RF/IF manual gain, and AGC. Slave receiver sends 21.4 MHz IF signal through port 2. In master/slave, AFC, STEP & SCAN are prohibited.

WJ-8617B-20 Status=
WJ-8617B with ELF option (0.01-500 MHz), 10 IF BWs with 10, 50, 300 & 500 KHz, 1, 2, 4, 6, 8 & 10 MHz IFs supplied (widest available10 MHz), and modified for external LO input of 4.4-5.4 MHz. Also includes: SM, 488, SCS, (for ESL) OA#300561.

WJ-8617B-20 Rev. 1 2/3/86
To include video output impedance of 50 ohms nominal.

WJ-8617B-20 Rev. 2 12/29/86
Removes LFE and changes to ELF and delete minimum documentation.

WJ-8617B-20 Rev. 3 6/22/87
Changes 20-500 MHz frequency range to 0.01-500 MHz and makes FE unsupported. See type form for options.

WJ-8617B-20 Rev. 4
Changes LOGV to unsupported.

WJ-8617B-20 Rev.5
Adds information on optional IF BW cards and type numbers.

WJ-8617B-21 Status= 1/20/86
Has standard IEEE-488 remote interface and real-time clock. 1st & 2nd LO outputs are provided. FE LO output provided when installed. Type 796233-4 audio/video COR board replaces standard audio/video COR board. Three-step AFC feature replaces standard AFC. Software modified to function with WJ-8976/DFPA. For details see OA#300544. Options supported: TUN, MS, 10IF, RLOG, BITE, VBFO, PKC, DRD, 488, WBO, FE, SSB, SM, DFC, IFBW, LOGV, HFE, LFE, RTC, 10MHz SCS, FP, Consult engineering on: PSM, 232, ASO, NRT, TPC

WJ-8617B-21 Rev. 4 3/87
Differences unknown

WJ-8617B-22 Status= Project cancelled 8/1/86.
Customer's requirement will allow him to use a standard WJ-8617B.

WJ-8617B-23 Status= 11/86
Same as current WJ-8617B(S1) except modified to control WJ-9075 frequency extender. With WJ-9075 enabled, tuning above 1000 MHz is accomplished through the use of extender as a down converter for signals in the 1.0 - 4.5 GHz range. With extender disabled, receiver will function as a standard WJ-8617B(SI). Options supported: TUN, M/S, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO, FE, SSB, SM, DFC, IFBW, HFE, LIFE, RTC, 10MHZ. Options excluded: VLF, NRT, PRE, TPC. Consult engineering on: LOGV, 232, ASO.

WJ-8617B-23 Rev. 1 3/88
Frequency readout option TUN is standard.

WJ-8617B-24 Status= 12/29/86 Rev. 10/15/87
WJ-8617B with LFE & FE covers 10.5-1100 MHz, 10 IF BWs (widest is 10 MHz), Modified for external LO input of 4.4-5.4 MHz and to include video output with an impedance of 50 ohms nominal. BWs include 10K, 50K, 300K, 500K, 1 M, 2M, 4M, 6M,

8M, 10M. Supported options include: TUN, MS, 10IF, VBFO, PKC, 488, 232, WBO, FE, SSB, SM, IFBW, HFE, LFE, RTC, 10MHz.

WJ-8617B-24 Rev. 2
Changes frequency range to 0.5-1100 MHz.

WJ-8617B-24 Rev. 3
Adds optional IF BW cards and type numbers (see file for complete information).

WJ-8617B-25 Status= 7/87
WJ-8617B receiver modified to operate with WJ-9073-2 tracking preselector. Installation of serial interface in option slot 5 or 6 precludes the use of certain options depending on which option slot is used. Consult engineering on the use of the following options: MS, RLOG, DAV, ASO, NRT, HFE, LFE. Options supported: TUN, 10IF, BITE, VBFO, PKC, DRD, PSM, 488, 232, WBO, FE, ISB, SSB, SM, DFC, IFBW, LOGV, RTC, 10MHZ, TPC, SCS, FP.

WJ-8617B-26 Status= 10/87
WJ-8617B receiver with VLF converter. Allows tuning down to 0.01 MHz. Has two dedicated antenna inputs: 0.01 -5.99 MHz AND 5.99-500 MHz. The VLF converter eliminates the FE option. Noise figure is typically 13 dB below 6 MHz and 3rd order intercept point is 0 dB.

WJ-8617B-26 Rev. 1: 10/87
Note: A 6 MHz IF was ordered. The voltage code for the 10 MHz IF BW will be used for the 6 MHz IF.

WJ-8617B-27 Status= 11/87
Same as WJ-8617B receiver (old microprocessor) except for the following:
(1) includes all modifications of the WJ-8617B-1 "TCAS" receiver.
(2) AGC dump, with fast attack.
(3) has the following standard options: RS-232, RLOG, RTC, SMO, BITE, EM, CUR, LOC, DRD.
(4) Software revision level 2.2.8

WJ-8617B-28 Status= 2/29/88
Same as WJ-8617B(S1) except software modified. Scan and step service request operation altered per customer requirement. All standard receiver options are supported. See type # file for customer specification.

WJ-8617B-29 Status= 5/88
Same as WJ-8617B except it will accept a 6 MHz IF BW and delete an 800 kHz BW as all bandwidth codes have been used in this receiver. Options requested: 10IF, BITE, DRD, 488, WBO-2, FE, SSB, SM, LOGV, LFE, Supported options: all except TPC

WJ-8617B-30 Status= 1/89

WJ-8617B receiver with VLF converter. Allows tuning down to 0.01 MHz and eliminates the FE option. Noise figure is typically <18 dB below 3 MHz, <15 dB from 3 MHz to 20 MHz and <11 dB above 20 MHz. Video output impedance is 50 ohms nominal. Ten IF BW's supplied including 25K, 75K, 100K, 200K, 300K, 500K, 1.5M, 4M, 10M. One RF input (ANT1). ISB is standard. This design was done for ESL.

WJ-8617B/FEDF Status=

For use with WJ-8976 DF system. Permits receivers to operate up to 1100 MHz.

WJ-8617B/FEXDF Status=

For use with WJ-8976 DF system. Permits receivers to operate up to 1200 MHz.

****

Contributors include Geoff Greer and Allan Langer

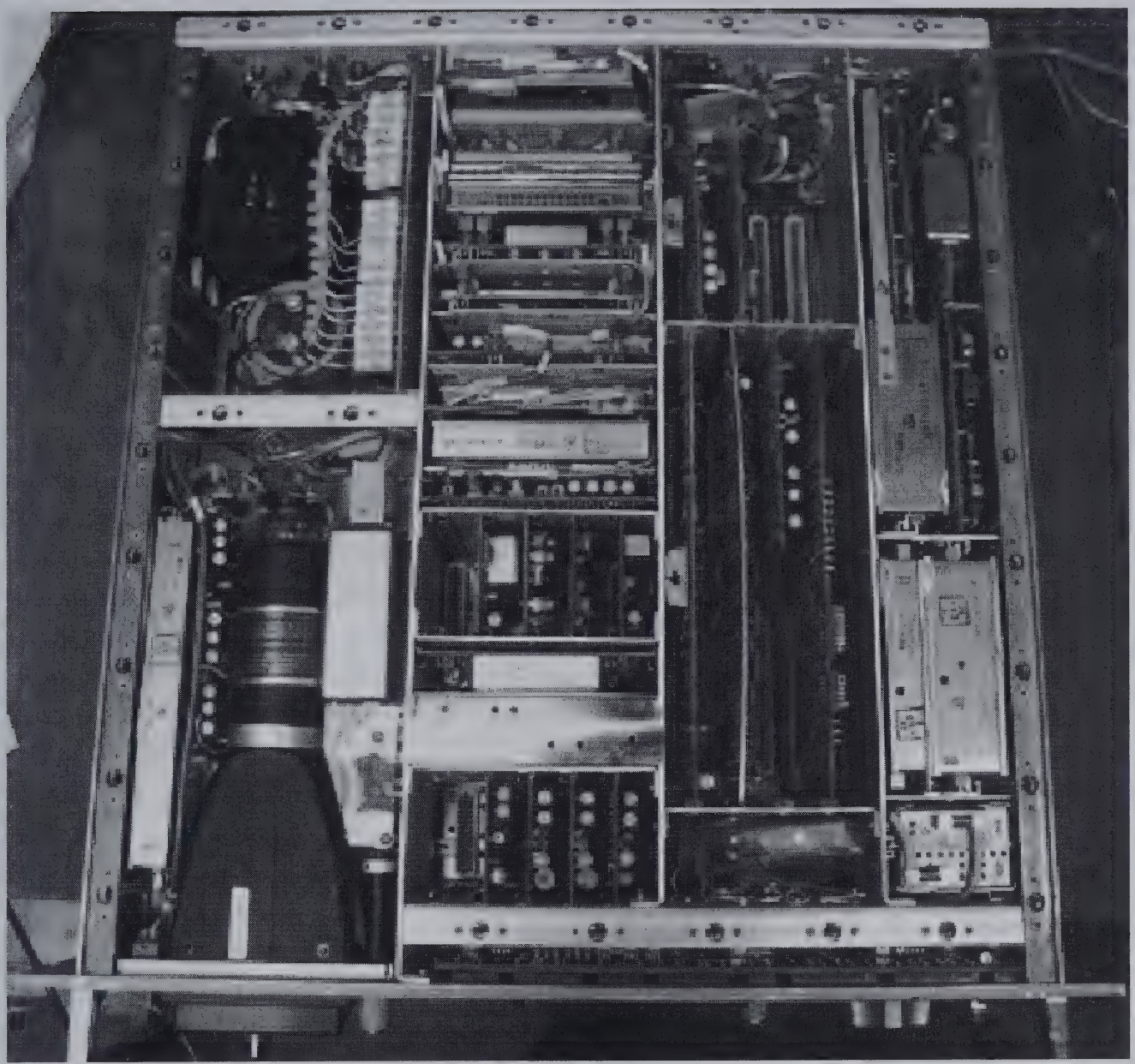
Table 2-1. Synthesizer Interface Switch Configurations

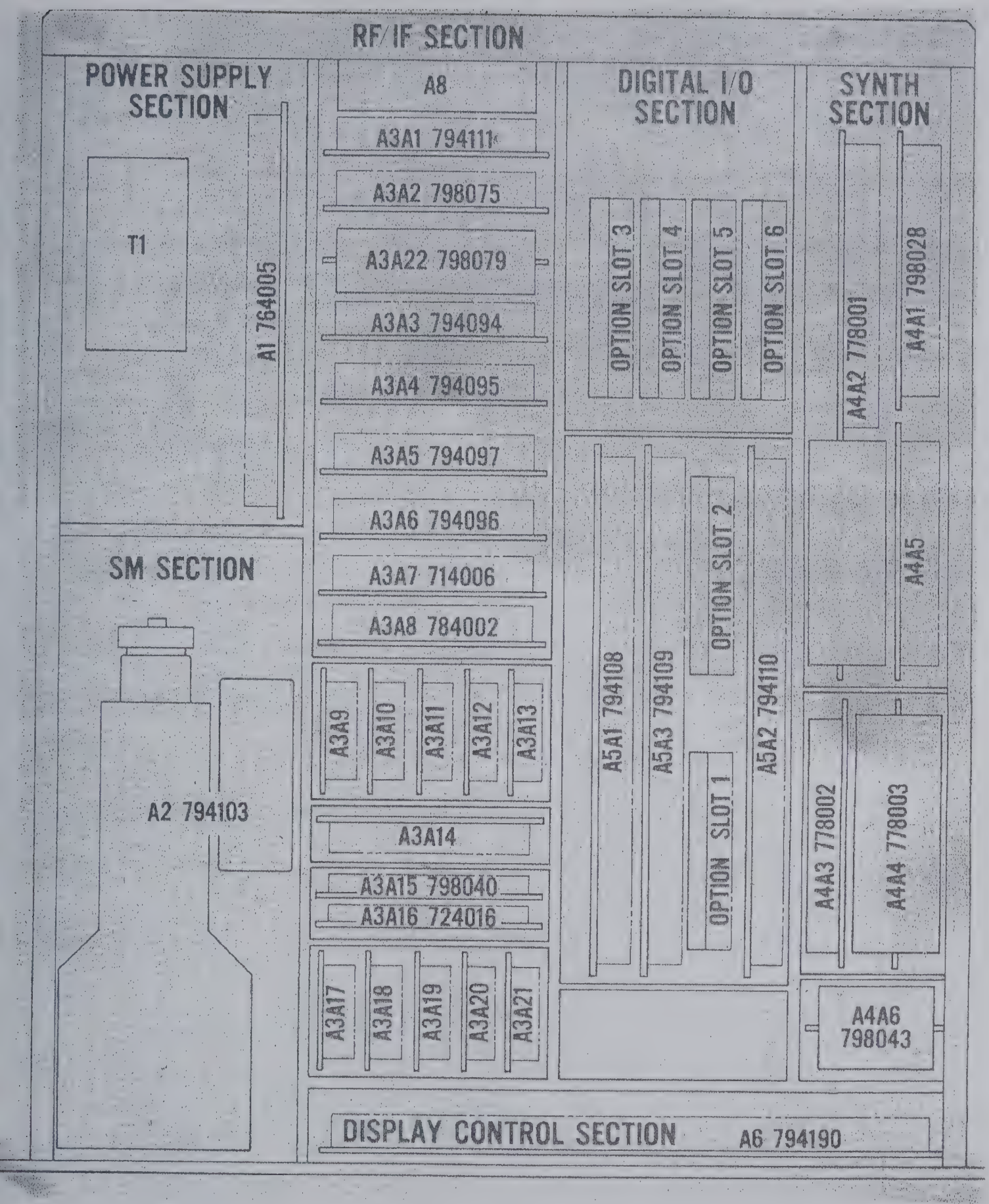
S1 switch settings are listed below:

Switch S1 on A5A2						
6	5	4	3	2	1	Function Selected
1	-	-	-	-	-	Selects Variable Tuning Resolut 100 Hz to 10 MHz)
0	-	-	-	-	-	Selects Normal Tuning R (100 Hz, 10 kHz, 1 MHz only)
-	1	-	-	-	-	Selects Dual IF Amplifiers (up bandwidths)
-	0	-	-	-	-	Selects Single IF Amplifiers (u bandwidths)
-	-	*	-	-	-	Spare (for future expansion)
-	-	-	*	-	-	Spare (for future expansion)
-	-	-	-	1	-	Enables SSB Option
-	-	-	-	0	-	Disables SSB Option
-	-	-	-	-	1	Frequency Extender Option Inste
-	-	-	-	-	0	Frequency Extender Option Not

S2 switch settings are listed below:

Switch S2 on A5A2								
8	7	6	5	4	3	2	1	Function Selected
*	-	-	-	-	-	-	-	Spare (for future expansion)
-	1	-	-	-	-	-	-	Pre-dwell Selected
-	0	-	-	-	-	-	-	Post-dwell Selected
-	-	1	-	-	-	-	-	NRT Disabled
-	-	0	-	-	-	-	-	NRT Enabled
-	-	-	*	-	-	-	-	Spare (for future expansion)
-	-	-	-	*	-	-	-	Spare (for future expansion)
-	-	-	-	-	1	-	-	LOG 40 dB LOG Scale Selected
-	-	-	-	-	0	-	-	LOG 60 dB LOG Scale Selected
-	-	-	-	-	-	*	-	Spare (for future expansion)
-	-	-	-	-	-	-	*	Spare (for future expansion)




RF/IF SECTION
POWER SUPPLY SECTION
T1
A1 764005
SM SECTION
A2 794103
A8
A3A1 794111
A3A2 798075
A3A22 798079
A3A3 794094
A3A4 794095
A3A5 794097
A3A6 794096
A3A7 714006
A3A8 784002
A3A9
A3A10
A3A11
A3A12
A3A13
A3A14
A3A15 798040
A3A16 724016
A3A17
A3A18
A3A19
A3A20
A3A21
DIGITAL I/O SECTION
OPTION SLOT 3
OPTION SLOT 4
OPTION SLOT 5
OPTION SLOT 6
A5A1 794108
A5A3 794109
OPTION SLOT 2
OPTION SLOT 1
A5A2 794110
SYNTH SECTION
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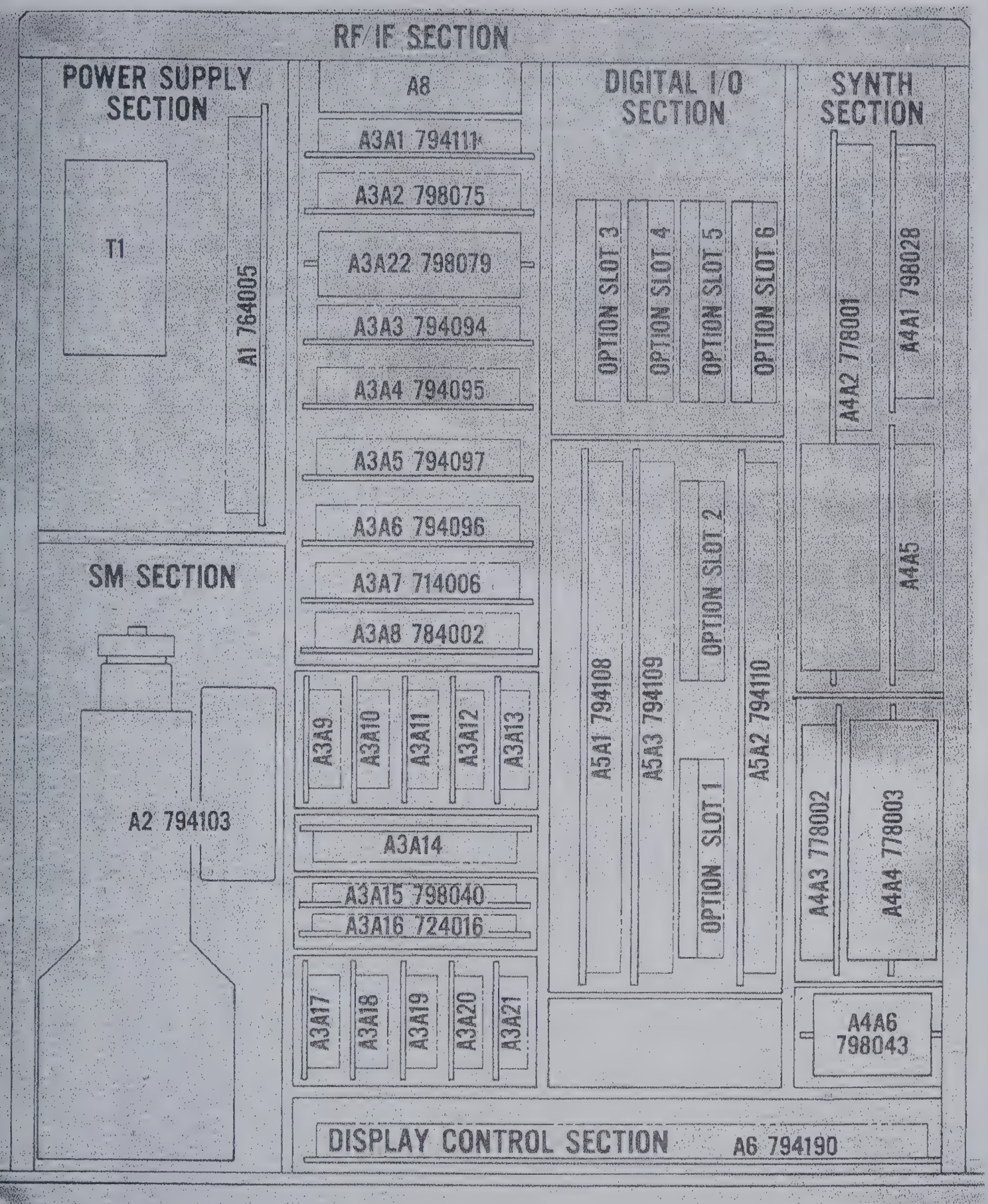
DISPLAY CONTROL SECTION
A6 794190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SM SECTION
A2 794103
A8
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A3A3 794094
A3A4 794095
A3A5 794097
A3A6 794096
A3A7 714006
A3A8 784002
A3A9
A3A10
A3A11
A3A12
A3A13
A3A14
A3A15 798040
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OPTION SLOT 3
OPTION SLOT 4
OPTION SLOT 5
OPTION SLOT 6
OPTION SLOT 2
OPTION SLOT 1
A5A1 794108
A5A3 794109
A5A2 794110
SYNTH SECTION
A4A2 778001
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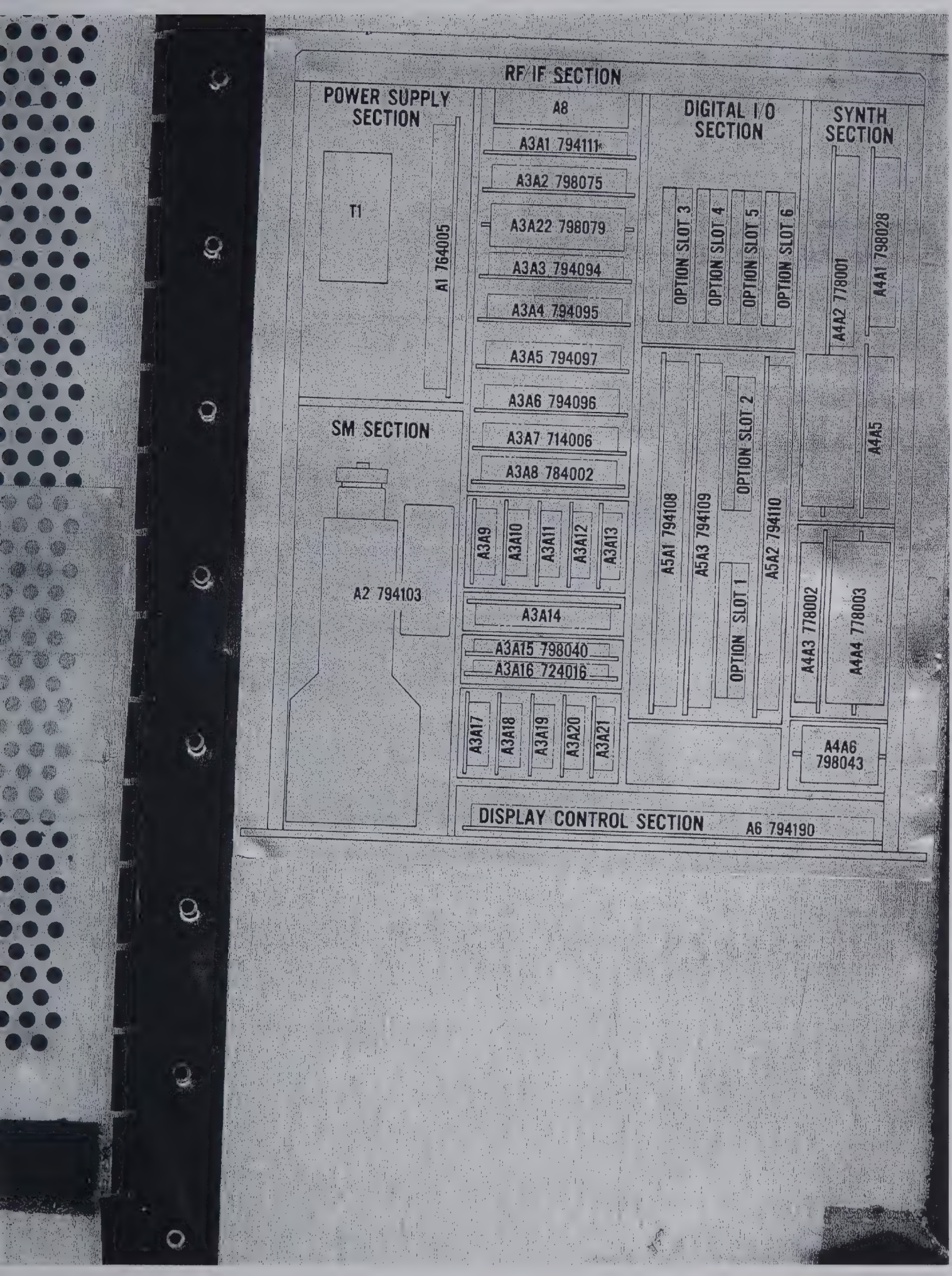
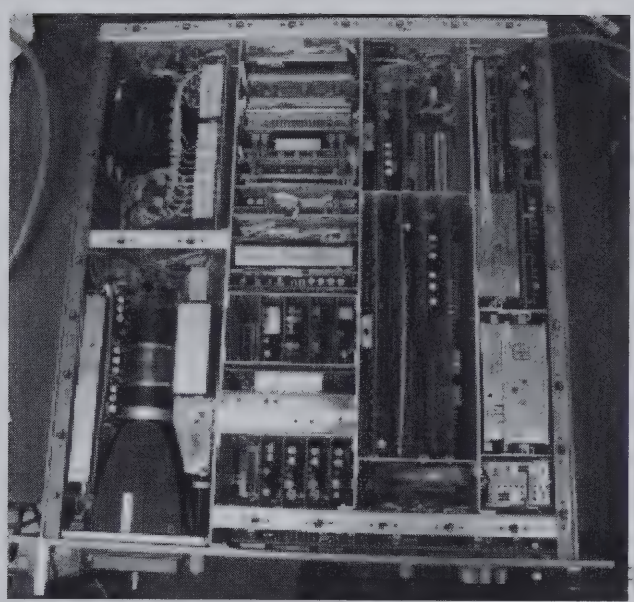
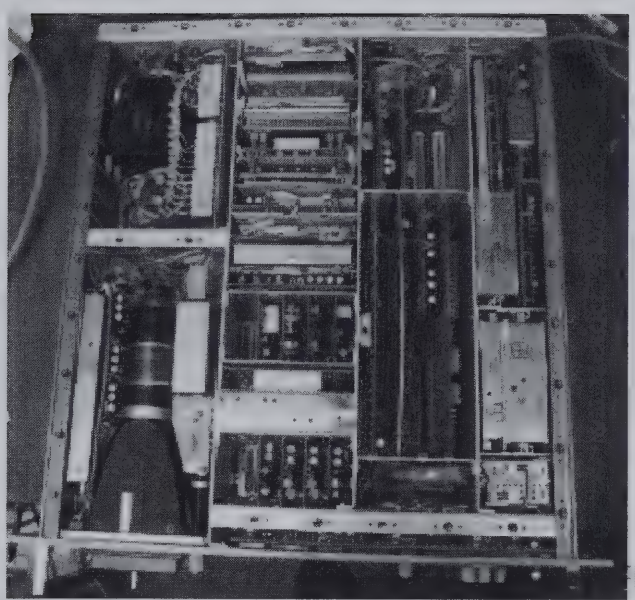
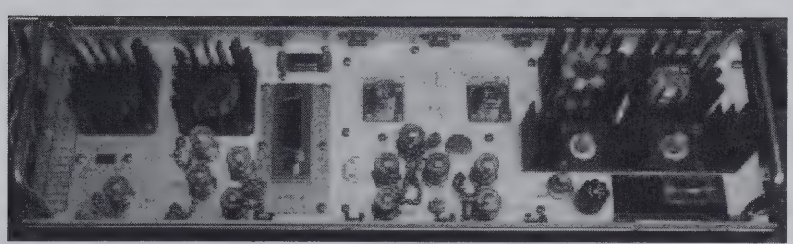
A4A6 798043
DISPLAY CONTROL SECTION
A6 794190


RF/IF SECTION
POWER SUPPLY SECTION
T1
A1 764005
SM SECTION
A2 794103
A8
A3A1 794111
A3A2 798075
A3A22 798079
A3A3 794094
A3A4 794095
A3A5 794097
A3A6 794096
A3A7 714006
A3A8 784002
A3A9
A3A10
A3A11
A3A12
A3A13
A3A14
A3A15 798040
A3A16 724016
A3A17
A3A18
A3A19
A3A20
A3A21
DIGITAL I/O SECTION
OPTION SLOT 3
OPTION SLOT 4
OPTION SLOT 5
OPTION SLOT 6
OPTION SLOT 2
OPTION SLOT 1
A5A1 794108
A5A3 794109
A5A2 794110
SYNTH SECTION
A4A2 778001
A4A1 798028
A4A5
A4A3 778002
A4A4 778003
A4A6 798043
DISPLAY CONTROL SECTION
A6 794190







Watkins Johnson WJ-861x Information

covering WJ-8615, WJ-8616, WJ-8617 and WJ-8618 receivers

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Notes

These receivers vary wildly in configuration, options, and coverage. Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

On the 8617 / 8618, the version number is rarely printed on the front panel. It is occasionally printed or handwritten on the rear panel option sticker. Sometimes it is written on the window cover of the microprocessor card EPROMs. These dash numbers appear to be more of an internal WJ code for designating the starting point in meeting a customers needs.

Notes on 8617 / 8618 versions:

The B versions of the 8617and 8618 have a completely redesigned synthesizer/LO system that is not compatible with A versions. It is quieter and more stable.

The S1 versions of the 8617 / 8618 have a new processor board and improved bus system. The new 8609 processor boards are not compatible with earlier receivers. The S1version of the receivers are often not marked externally. Look at the processor board to be sure or try holding the manual button in while you turn the radio on. An S1 will display the version number. See guide for format of power up display.

Watkins Johnson 8615 series VHF/UHF - Receiver Versions 7-8-02

Note: Exact version is displayed in digital display for a few seconds at power-up

Version format XX.YY where
XX represents the Type **YY represents the Revision (0-99)**

Type

Type AA	WJ-8615	Amended "A" version used only with A.08 and AA.08
Type A	WJ-8615	Standard 8615 software
Type D	WJ-8615D	Standard 8615D software
Type E	WJ-8615/SSL	8615 with Scan/Step/Lockout option*
	WJ-8615D/SSL	8615/D with Scan/Step/Lockout option*
Types F & FD		No additional information available

* Scan/Step/Lockout adds associated scan functions and enables WJ-8610A controller to gather spectrum displays for system integration

Revision (software)

Original software was A.0 and has been revised a number of times. A brief overview follows:

Ver A.0.3
Rx power up sequence modified to improve 1st LO lock-up at all frequencies.
Gain normalization tables contained in RAM, were implemented to increase gain normalization across varying bandwidths.

Ver A.0.4
Tuning meter modified to accommodate spectrum reversal with implementation of Frequency Extender (FE) option and receiver is tuned above 500MHz

Ver A.0.5
Digital control section signature analysis subroutine relocated in memory, to provide increased reliability in the analysis results.

Ver A.0.6
Tuning meter subroutines modified to prevent meter self-centering after reaching endstop - eliminates false center readings.
2nd LO tuning subroutine modified for net increase in tuning lock speed.
Other modifications allow for recognition of following IF bandwidths: 3.2KHz, 15KHz, 30KHz, and 250KHz. Also bandwidth sizing is provided for SSB operation, allowing auto

selection of the 1st IF bandwidth greater than 6.4KHz when in SSB mode.

Ver A.0.7

Calibration subroutine added to operating system that generates a data table in RAM, providing optimum tuning of the 2nd LO synthesizer. This provides faster and more reliable 2nd LO synthesizer operation. Fifteen minutes after power-up, the 2nd LO CAL routine is executed. During the first 15 minutes of operation, the 2nd LO uses fixed ROM data. During a 2nd LO CAL operation, "2nd CAL" is displayed and front panel operation is disabled. Front panel operation is restored when 2nd LO CAL is completed.

The Front Panel Definitions mode allows the 2nd LO CAL routine to be enabled (2CAL ON) or disabled (2CAL OFF). When enabled, the 2nd LO uses data tables generated in RAM as a result of the 2nd CAL routine; when disabled, the 2nd LO uses fixed data tables factory loaded in ROM. Additional error codes have been added to service the 2nd LO CAL routine.

Ver A.0.8

The 488 busy bit is set while receiver is responding to a query. Additionally, the Master Receiver does not respond to selection of SSB or ISB if the slave receiver is not so equipped. Previously, this caused 488 control lockup.

Note: ***Due to the hardware changes required to support SSL, version A.0.9 and later are not backward compatible with previous versions.***

Ver A.0.9

Step-Scan-Lock options are supported beginning with this revision.

Tuning meter operation is modified to allow half-step operation (manifested by illumination of two bars at various levels)...this tends to smooth the relationship between tuning meter readout and actual tuned position within bandpass.

Manual gain control limits are indicated with "--" at either end of the control range.

Automatic IF bandwidth control has been refined. Selecting SSB mode causes receiver to search installed filters to locate the the narrowest filter (equal or greater than 6.4KHz) regardless of its location. When exiting SSB mode, the bandwidth previously in use is reselected.

In Front Panel Definitions Mode, a mode change now requires a full 45 degree rotation of the tuning knob. This desensitizes this adjustment, requiring deliberate effort to effect a change.

The BFO and COR buttons toggle their associated functions on/off.

Pressing the BFO key while in CW or SSB or ISB, causes the BFO offset setting to replace the tuned frequency display. Pressing the BFO key again restores the frequency readout at its previous tuning resolution.

With COR enabled, the CHANGE pushbuttons vary the COR level.

In the TEST mode, the operator may observe actual synthesizer frequency in the tuning display for diagnostic purposes.

488 revisions include elimination of inconsistent responses to signal strength queries.

Commands and queries may now be formatted as strings, each command separated by a semi-colon. The receiver responds in same format.

Version A1.1/D1.1
Modified version of the A1.0/D1.0 software.
AGC AM detector is now 2V pk, allowing fast AGC. The AGC sample window is now 30msec.
In binary 488 mode, the semi-colon is removed from the VER? query.

Ver A.1.1
Software version may be used in either processor type in the 796242 assembly in U3 and U4, or in type 796495 processors in U9.

Ver D.0.9
Standard software based on ver A.0.9, incorporating SSL.

Ver D.1.0
The CAL2 operation was modified to allow operator to interrupt a Scanning calibration.
The Fast Scan LO (FSLO) and Extended Memory (EM) have been incorporated. BFO tuning can be exited by pressing any tune-related key.

Ver E.0.3
Version based on D.0.9 allows LOK command to lock out twice the selected IF bandwidth. LCK and RLK commands require a question mark (?). SRQ is set after data is entered into the queue.

Ver E.0.4:
Version based on D.1.0. Changes as follows:
Scan parameters when going from Scan to Manual Scan. The sync pulse timing has been adjusted to maintain specified limits during the extra time required for the 5KHz interpolation.
It provides a calibration check at power-up, preserves receiver mode through power-down/up, and has added the SCM (Scan Manual) and STM (Step Manual) commands.

Ver E.0.5
Scan dwell time has been increased to 150msec during scan, allowing sufficient 2nd LO lock time when a signal greater than COR level is encountered.
The CLM command now only clears memory.
The BIN command is allowed during Step or Scan mode.

Ver E.0.6
Version based on E.0.5. Provides following additional capabilities:
The "start-of-sync-pulse" is enabled at the start of Scan; the BFO sign bit (+/-) is saved in channel memory.
The COR bit (in the status byte) is reset when a Scan or Step command is set and the CAL abort flag has been added.

Ver E.0.7

Implements new Calibration timers for @nd LO CAL routines.

Ver E.1.0
Allows processor type 796495-5 to provide EPROM selectable options.
Software selectable options are SSL and EM.

Ver E.2.0
Version based on E.0.4 for SSL: allows tuning to ZERO and provides LO lock check routine.

Ver F0.0.0
Special version based on ver E.0.6:
Resets COR output when Scan or Step command is received.

Ver FD.0.1
Special version
Provides a SSL routine (no further info found).

Ver FD.0.7
Allows option to cause signal acquisition by edge triggering, thus avoiding duplicate lockons possibly off-center tuned. (no further info found).

Ver FD.0.9
Added Auto Cal and Scan Increment subroutines in operating software.

WJ-8617 and WJ-8617A Receiver Versions

10-16-03

WJ-8617 Series

WJ-8617 Status = M 5/4/77

General purpose VHF/UHF receiver with 20 - 1000 MHz coverage. Synthesized, digitally controlled receiver with built-in signal monitor.

WJ-8617-2 Status = M 1/18/80

20 - 1100 MHz remotely controlled receiver. AM, FM, and CW reception. Voltage tuned preselectors (20% BW). Noise figure 20 - 500 MHZ is 9 dB typical, 500 - 1100 MHz is 10 dB typical. Internal signal monitor data over 20 Hz - 20 kHz line. Control data received 300 - 2800 Hz. 600 Ohm video output. 6 RF inputs.

WJ-8617A Series

WJ-8617A Status= 1980

General purpose receiver. Digitally controlled. With VHF/UHF range of 20-1100 MHz

WJ-8617A-1 Status = M 8/14/80

Same as WJ-8617A without signal monitor. (Bruff)

WJ-8617A-3 Status= M 8/14/80

WJ-8617A with blank front panel. This is for remote control. Unit must have IEEE-488 or RS-232C interface option.

WJ-8617A-4 Status = M 8/15/80

WJ-8617A with signal monitor deleted. AGC threshold detector of 30 dB (-1 +2 dB). Analog AGC outptut. Wideband IF output of -13 to -33 dBm. FM detector accuracy to ithin 3% of straight line over 80% of the IF bandwidth. Antenna switch.

WJ-8617B Receiver Versions 10-17-03

WJ-8617B Status= 11/2/83
Frequency range 20 - 500 MHz (1100 MHz with FE option) Fully synthesized. 100 Hz tuning resolution. Sythesizer settling time 3 mS. AM, FM, CW & PULSE detection modes (SSB, LOG optional). LOG/LIN signal monitor. Low RFI design meets MIL-STD-461A. Five selectable IF bandwidths (many available options). Modular construction. Built for low mean time to repair (MTTR).

WJ-8617B-1 Status = M 4/82
For customer *****. Modified WJ-827B for TCAS. Contains software changes that modify operation of dwell control and adds capability of manual logging and operating a real-time clock. Unique front panel. Software version must be less than v2.2. See file for list of options installed as standard.

WJ-8617B-2 Status = M 3/26/82
Fast acquisition receiver. Designed to scan 1 MHz increments with settings: step size = 1 MHz; dwell = 0. Front panel will be blank. DRD display may not use entire SDU screen. Non-MHz digits in the memory channels will be ignored. Scan time will be 50 mS. See file for complete details.

WJ-8617B-3 Status=
Same WJ-8617B except 794190-1 front panel display and controls sub-assembly replaced with WJ-8617B-3FP front panel. WJ-8617B-3FP contains on/off switch, power indicator, phone jack, and audio level control. Radio to be remote controlled from external device via IEEE-488 remote interface.

WJ-8617B-4 Status= 4/82
Modified WJ-8617B with IF bandwidths of 10, 20, 50, and 100 KHz. "B" version Karakal receiver with NRT. Special designation for scan, step, lock out, etc. Options included: EM, DRD, IEEE-488, LOC, H/O, and M/S.

WJ-8617B-5 Status= 3/1/83
The units are being developed for the TRQ-32 program. Special functions are: 1) 150 Hz recognition - with 150 Hz, without 150 Hz, and all signals. 2) Bandwidth output data - remote indication of active bandwidth. 3) Low frequency extension 0.5 - 20 MHz. 4) IF bandwidth of 3.2 kHz. (Bruff/Deeb)

WJ-8617B-5 Rev. 1: 1/89
Updates standard equipment included in WJ-8617B-5 unit. Signal monitor, Digital refreshed display, Single sideband, IEEE-488 interface bus. IF BWs for WJ-8617B-5, IF amplifiers for 3.2 KHz, 10 KHz, and 50 KHz, FM demodulators for 3.2 KHz, 10 KHz, and 50 KHz.

WJ-8617B-6 Status = P 4/29/83
This is a contract item for ***** Associates. Options installed: 488, SSB. IF BWs: 10 KHz, 25

KHz. see file for special requirements installed.

WJ-8617B-7 Status = M 5/13/83
***** Associates unit. Options installed: 488, SSB. IF BWs: 10 KHz, 25 KHz. See file for special requirements installed.

WJ-8617B-8 Status=
Feldspar receiver. Front panel light green. Tuning range of 10 KHz-500 MHz (VLF converter option). Video output level control on front panel with DAV and concentric audio control for front and rear panel output level. WBO option, but with 10.7 MHz center frequency (BW at least 8 MHz). AM detector dynamic range of 45dB minimum. With IF BW not greater than 50 KHz. Frequency offset can be entered via front panel or IEEE-488 bus. Disabled AGC ahead of SM. Positive video output. IF BW options not less than 300 KHz limited to the following (in KHz): 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 3200, 4000.

WJ-8617B-8 Rev 2:
EM option required.

WJ-8617B-8 Rev 3:
SSB option supported.

WJ-8617B-9 Status= 8/84
Similar to WJ-8617B except has different standard features: RS-232 remote interface; real-time clock; 1st and 2nd LO outputs are provided. FE LO output provided when installed. Type 796233-4 audio/video COR board replaces standard audio/video COR board. Three-step AFC feature replaces the the standard AFC. Software modified to function with WJ-8976 DF processor. Options supported: TUN, MS, FE, SSB, SM, LOGV, HFE, LFE, RTC. Consult engineering on options: VLF, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, WBO, ASO, NRT, DFC, IFBW, 10MHZ, PRE, TPC.

WJ-8617B-9 Rev. 1 9/12/86
Differences not known.

WJ-8617B-10 Status= 11/83
Same as WJ-8617B except: Special "dump" front panel with dump memory channel, load memory channel, and clear memory channel. Storage allocations fixed: channels 0-47 for step and scan frequencies; channles 48-63 for sweep scan frequencies; and channels 64-95 for lockout frequencies.

WJ-8617B-11 Status= 11/83
Same as WJ-8617B except special synthesizer of 5, 110, and 30 ms settling times. Optimized control software for receiver processor steps and scans and dwell periods. Wideband IF and mode query.

WJ-8617B-12 Status= 3/5/84
(Configuration 5, DF box). Software modifications: 1) Combine box special software (WJ-

8617B-10) and utilize LO master/slave (WJ-8617B-6); 2) Support fully functional front panel and SM, LOC, CUR, 488, 10, 20, 50 mS. Hardware modifications: 1) Rear panel identical to WJ-8617B-6. No front panel bezel change; 2) Add LO modules. See type number card.

WJ-8617B-13 Status= 3/5/84

(Configuration 5, DF box). Software same as WJ-8617B-12. Hardware reconfigured as follows: 1) remove A3A8 through A3A21 modules; A4A1 through A4A6 modules; A4 motherboard. Uses 8617B-3 front panel. New nameplate. Create new mainframe plate and schematic. Add 488 option only. Add 2nd LO amplifier. See type number card.

WJ-8617B-14 Status= 7/84

Similar to WJ-8617B with modified software to bias the display frequency with respect to the actual frequency. Units will have 10 IF BWs and buttons. New name plate. Generate CPL.

WJ-8617B-15 Status= 9/84

Same as WJ-8617B except that the IF output on the rear panel is provided through a BNC rather than a TNC connector.

WJ-8617B-16 Status= 10/84

WJ-8617B modified to provide noise figure of less than 6 dB. Decade tuning (TUN) and10 IF bandwidths standard. Designed for narrowband tempest testing.

WJ-8617B(S1) Receiver Versions

The S1 version of the WJ-8617B will display version and EPROM revision information on boot-up. Hold the manual button down while turning on the power. The display will show:

Signal Strength	Memory Channel	Frequency MHz	Frequency kHz
86	**17**	**-XX**	**Y.YY**

The radio is an **8617**.

XX is the dash number. **Y.YY** is the EPROM (software) revision number

WJ-8617B(S1) Status= 4/85
New microproccesor card uses MC6809 processor. Not backward compatible with old units. Most options supported in microprocessor board ROMs rather than on option card ROMs (latest major software upgrades).

WJ-8617B(SI)-3 Status= 6/25/85
Sames as the WJ-8617B-3 except has new microprocessor board (WJ type 796353-2) installed. New board will improve RS-232 interface and communication.

WJ-8617B-17 Status= 10/84
Same as WJ-8617B(S1) but with low noise amplifier instead of antenna switch. Antenna 1 input is dedicated to 0.5 - 500 MHz and antenna 2 is dedicated to 500 - 1100 MHz input. The noise figure is typically 4 dB in VHF and 6 dB in UHF.

WJ-8617B-17 Rev. 1 2/87
Differences not known.

WJ-8617B-17 Rev. 2 1/89
Adds FE and SM as standard options.

WJ-8617B-18 Status=
Design per ***** specifications (see file). Front panel with green LEDs. Tuning range of 10KHz-500MHz (VLF converter). Video output level control on front panel with DAV option and concentric audio control for front & rear panel output level. WBO, but with 10.7 MHz center frequency (BW at least 8 MHz). AM detector dynamic range of 45 dB minimum with IF BW not greater than 50 KHz. frequency offset can be entered via front panel or RS-232 interface. Disable AGC ahead of spectrum monito. Positive video. IF BWs not less than 300KHz limited to the following selections (KHZ): 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 3200, 4000.

WJ-8617B-18 Rev. 1

EM is required option

WJ-8617B-18 Rev. 2
SSB option is supported.

WJ-8617B-19 Status= 6/25/85
Controls WJ-8617B(SI)-3 through RS-232 communication link in normal mode. Same as WJ-8617B in master/slave. Sends out tuned frequency, antenna select, RF/IF manual gain, and AGC. Slave receiver sends 21.4 MHz IF signal through port 2. In master/slave, AFC, STEP & SCAN are prohibited.

WJ-8617B-20 Status=
WJ-8617B with ELF option (0.01-500 MHz), 10 IF BWs with 10, 50, 300 & 500 KHz, 1, 2, 4, 6, 8 & 10 MHz IFs supplied (widest available10 MHz), and modified for external LO input of 4.4-5.4 MHz. Also includes: SM, 488, SCS, (for ESL) OA#300561.

WJ-8617B-20 Rev. 1 2/3/86
To include video output impedance of 50 ohms nominal.

WJ-8617B-20 Rev. 2 12/29/86
Removes LFE and changes to ELF and delete minimum documentation.

WJ-8617B-20 Rev. 3 6/22/87
Changes 20-500 MHz frequency range to 0.01-500 MHz and makes FE unsupported. See type form for options.

WJ-8617B-20 Rev. 4
Changes LOGV to unsupported.

WJ-8617B-20 Rev.5
Adds information on optional IF BW cards and type numbers.

WJ-8617B-21 Status= 1/20/86
Has standard IEEE-488 remote interface and real-time clock. 1st & 2nd LO outputs are provided. FE LO output provided when installed. Type 796233-4 audio/video COR board replaces standard audio/video COR board. Three-step AFC feature replaces standard AFC. Software modified to function with WJ-8976/DFPA. For details see OA#300544. Options supported: TUN, MS, 10IF, RLOG, BITE, VBFO, PKC, DRD, 488, WBO, FE, SSB, SM, DFC, IFBW, LOGV, HFE, LFE, RTC, 10MHz SCS, FP, Consult engineering on: PSM, 232, ASO, NRT, TPC

WJ-8617B-21 Rev. 4 3/87
Differences unknown

WJ-8617B-22 Status= Project cancelled 8/1/86.
Customer's requirement will allow him to use a standard WJ-8617B.

WJ-8617B-23 Status= 11/86
Same as current WJ-8617B(S1) except modified to control WJ-9075 frequency extender. With WJ-9075 enabled, tuning above 1000 MHz is accomplished through the use of extender as a down converter for signals in the 1.0 - 4.5 GHz range. With extender disabled, receiver will function as a standard WJ-8617B(SI). Options supported: TUN, M/S, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO, FE, SSB, SM, DFC, IFBW, HFE, LIFE, RTC, 10MHZ. Options excluded: VLF, NRT, PRE, TPC. Consult engineering on: LOGV, 232, ASO.

WJ-8617B-23 Rev. 1 3/88
Frequency readout option TUN is standard.

WJ-8617B-24 Status= 12/29/86 Rev. 10/15/87
WJ-8617B with LFE & FE covers 10.5-1100 MHz, 10 IF BWs (widest is 10 MHz), Modified for external LO input of 4.4-5.4 MHz and to include video output with an impedance of 50 ohms nominal. BWs include 10K, 50K, 300K, 500K, 1 M, 2M, 4M, 6M, 8M, 10M. Supported options include: TUN, MS, 10IF, VBFO, PKC, 488, 232, WBO, FE, SSB, SM, IFBW, HFE, LFE, RTC, 10MHz.

WJ-8617B-24 Rev. 2
Changes frequency range to 0.5-1100 MHz.

WJ-8617B-24 Rev. 3
Adds optional IF BW cards and type numbers (see file for complete information).

WJ-8617B-25 Status= 7/87
WJ-8617B receiver modified to operate with WJ-9073-2 tracking preselector. Installation of serial interface in option slot 5 or 6 precludes the use of certain options depending on which option slot is used. Consult engineering on the use of the following options: MS, RLOG, DAV, ASO, NRT, HFE, LFE. Options supported: TUN, 10IF, BITE, VBFO, PKC, DRD, PSM, 488, 232, WBO, FE, ISB, SSB, SM, DFC, IFBW, LOGV, RTC, 10MHZ, TPC, SCS, FP.

WJ-8617B-26 Status= 10/87
WJ-8617B receiver with VLF converter. Allows tuning down to 0.01 MHz. Has two dedicated antenna inputs: 0.01 -5.99 MHz AND 5.99-500 MHz. The VLF converter eliminates the FE option. Noise figure is typically 13 dB below 6 MHz and 3rd order intercept point is 0 dB.

WJ-8617B-26 Rev. 1: 10/87
Note: A 6 MHz IF was ordered. The voltage code for the 10 MHz IF BW will be used for the 6 MHz IF.

WJ-8617B-27 Status= 11/87
Same as WJ-8617B receiver (old microprocessor) except for the following:
(1) includes all modifications of the WJ-8617B-1 "TCAS" receiver.
(2) AGC dump, with fast attack.
(3) has the following standard options: RS-232, RLOG, RTC, SMO, BITE, EM, CUR, LOC, DRD.

(4) Software revision level 2.2.8

WJ-8617B-28 Status= 2/29/88
Same as WJ-8617B(S1) except software modified. Scan and step service request operation altered per customer requirement. All standard receiver options are supported. See type # file for customer specification.

WJ-8617B-29 Status= 5/88
Same as WJ-8617B except it will accept a 6 MHz IF BW and delete an 800 kHz BW as all bandwidth codes have been used in this receiver. Options requested: 10IF, BITE, DRD, 488, WBO-2, FE, SSB, SM, LOGV, LFE, Supported options: all except TPC

WJ-8617B-30 Status= 1/89
WJ-8617B receiver with VLF converter. Allows tuning down to 0.01 MHz and eliminates the FE option. Noise figure is typically <18 dB below 3 MHz, <15 dB from 3 MHz to 20 MHz and <11 dB above 20 MHz. Video output impedance is 50 ohms nominal. Ten IF BW's supplied including 25K, 75K, 100K, 200K, 300K, 500K, 1.5M, 4M, 10M. One RF input (ANT1). ISB is standard. This design was done for ESL.

WJ-8617B/FEDF Status=
For use with WJ-8976 DF system. Permits receivers to operate up to 1100 MHz.

WJ-8617B/FEXDF Status=
For use with WJ-8976 DF system. Permits receivers to operate up to 1200 MHz.

WJ-8618A Receiver Versions 10-17-03

WJ-8618A Status=
Receiver with 20-1100 MHz coverage designed to meet stringent EMI/RFI specifications.

WJ-8618A-1 Status = M 8/14/80
Same as WJ-8618A without signal monitor.

WJ-8618A-3 Status = M 8/14/80
WJ-8618A with blank front panel. This is for remote control and unit must have IEEE-488 or RS-232C option installed.

WJ-8618A-4 Status = M 12/16/82
Same as WJ-8618 with pulse stretching added. SIS/WTE.

WJ-8618B Receiver Versions 10-17-03

WJ-8618B-1 Status = 3/83
Same as WJ-8618B except new software allowing modified scan and special subroutines upon detection of signals. Added front panel upper case functions for "scan down" and complete "scan" activation from 1100 MHz down to 20 MHz.

WJ-8618B-2 Status = 7/83
WJ-8618B modified for use with WJ-9195 DRD unit. "MULTARS" special software. See file for complete details of program.

WJ-8618B-3 Status =
WJ-8618B with blank front panel. This is for remote control and unit must have IEEE-488 or RS-232C option installed.

WJ-8618B-4 Status = 11/83
SSQ-80 receiver spec. keys, mnemonics and software changes.

WJ-8618B-6 Status = 12/8/83
Master/slave LO outputs. Special group delay equalized filters. 50 kHz, 400 kHz, 800 kHz, 2 MHz, 4 MHz. Similar to WJ-8617B-6 but with normal front panel controls.

WJ-8618B-7 Status = 4/84
LSB (J28) and USB (J29) available on the rear panel. Spare fuseholder removed and "WB-IF OUT" installed in that position.

WJ-8618B-8 Status= 5/84
Modified software and 794137-8 extended control subassembly adds seven uppercase functions to front panel pushbuttons (labeled A through G). Frequency display and tuning knob active in scan mode, with frequency display changing only with knob rotation. See files for complete information.

WJ-8618B-9 Status = 7/84
10IF option increases IF bandwidths available to ten. Variable tuning resolution similar to WJ-8615D. See file for further details.

WJ-8618B-10 Status = 10/84
VHF/UHF receiver. Same as WJ-8618B except includes BCD parallel output of tuning frequency and selectable internal or external local oscillator, RS-232.

WJ-8618B-11 Status = 2/85
Same as WJ-8618B except modified to contain master-slave/local (MS/LO) capabilitiy

WJ-8618B-12 Status = 11/1/85
Same as WJ-8618B-10 except has IEEE-488 instead of RS-232 communications. No external LO capability. 10 IF bandwidths, 10 MHz IF bandwidth (4 MHz/8 MHz BW is a special). Note:

does not include RTC and RLOG.

WJ-8618B-12 Revs. 1, 2, 3, & 4 1/13/86
Differences not listed.

WJ-8618B-13 Status = 12/10/85
Same as WJ-8618B-12 which has IEEE-488, parallel BCD output, 10 IF bandwidths. Also adds built-in tracking preselector. Supports 10 MHz IF bandwaidth and RLOG.

WJ-8618B-14 Status = 1/86
WJ-8618B changed to include: BCD parallel output of tuning frequency in option slot 6; RLOG in option slot 5; RTC in option slot 1; No external LO; 10 IF bandwidths supported up to 10 MHz IF bandwidth (4 MHz/8 MHz IF BW is special); Known options not supported: RS-232C interface; ASO; NRT; LOGV; BITE.

WJ-8618B-14 Rev 1 2/86
Differences not listed.

WJ-8618B-15 Status = 6/4/86
Same as WJ-8618B except modified for use with WJ-9195 DRD unit and to incorporate software changes per GTE specifications indicated on OA #300987, "High Noon" receiver. Enables receiver to work with WJ-9195 control unit. (See WJ-8168B-2 type number assignment form for details of WJ-9195 DRD modifications). Options supported: M/S, BITE, 488, WBO, FE, SM. (Has been seen with E-Systems tag and a light green front panel).

WJ-8618B-15 Rev. 1 7/86
M/S is not a supported option.

WJ-8618B-16 Status = 6/11/86
Similar to WJ-8617B with modified software to bias display frequency with respect to actual tuned frequency. All units have 10 IF bandwidths and buttons. New name plate. Nerate CPL. Also included: (1) 10 IF BWS selectable up to and including 10 MHz; (2) IF BWS supplied are: 10, 20, 50,100, 250, 500 kHz AND 1, 2, 4, and 10 MHz. Consult engineering regarding: algorithm of frequency offset; Options supported; 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO-2, FE, SSB, SM, NRT, LOGV, HFE. OA

WJ-8618B-16 Rev 1. 6/19/86
Differences not listed.

WJ-8618B(S1) Receiver Versions 10-17-03

The S1 version of the WJ-8617B will display version and EPROM revision information on boot-up. Hold the manual button down while turning on the power. The display will show

Signal Strength	Memory Channel	Frequency MHz	Frequency kHz
86	**18**	**-XX**	**Y.YY**

The radio is an **8618**.

XX is the dash number. **Y.YY** is the EPROM (software) revision number

WJ-8618B(S1) Status = 4/85
New microprocessor card using 8609. Not backward compatible with old units. (Latest major software updates included).

WJ-8618B-17 Status = 8/4/86
VHF/UHF receiver with modifications for the "Euphoria" program: (1) AGC dump; (2) Allow SRQ after frequency change if signal is present; (3) Decrease AGC attck time; (4) changed FM filter on interface board (AFC/FMO?)(Decreased time constant on FMDC); (5) software change to allow receiver to tune to "zero" frequency. Requested options: BITE, 488, SSB, SM, 10K, 20K, 50K, 300K, FP, AND SCS.

WJ-8618B-18 Status = 11/86
Same as current WJ-8618B(S1) except modified to control WJ-9075 1-4.5 GHz frequency extender. With WJ-9075 enabled, tuning above 1000 MHz is accomplished through the use of extender as down converter for signals in the 1 - 4.5 Ghz range. With extender disabled, receiver will functions as standard WJ-8618B(S1). Options supported: TUN, M/S, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO, FE, SSB, SM, DFC, IFBW, HFE, LFE, RTC,10MHZ. Options excluded: VLF, NRT, PRE, TPC. Consult engineering for information on LOGV, 232, ASO.

WJ-8618B-18 Rev 1. 3/88
Indicates TUN is now standard.

WJ-8618B-19 Status = 7/87
WJ-8618B receiver modified to operate with WJ-9073-2 tracking preselector. Installation of serial interface in option slot 5 or 6 precludes the use of certain options depending upon which option slot is used. Consult engineering on the use of the following options: RLOG, DAV, ASO. Options supported: TUN, 10IF, BITE, VBFO, PKC, DRD, PSM, 488, 232, WBO, FE, ISB, SSB, SM, DFC, IFBW, LOGV, RTC, 10MHz, TPC, SCS, and FP. Consult engineering on M/S, RLOG, ASO, HFE, LFE, DAV.

WJ-8618B-20 Status = 10/88

Same as WJ-8618B(S1) except digital motherboard is wired to support the NRT option. Digital motherboard type number is 798039-13, schematic number is 580515. Note: the DAV option will not work in this receiver. OA #302500/BEAM.

WJ-861x Receiver Options 10-17-03

The WJ-8615, WJ-8617 and WJ-8618 receivers vary wildly in configuration, options, and coverage. The codes are the same for all receivers but the options themselves require different boards and, in some cases, different software versions for different radios.

Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

10IF	Ten IF (receiver has ten slots for IFs and Demods 8617-8618 only)
10MHz	10 MHz maximum IF bandwidth (8 MHz is standard)
150Hz	150Hz tone sensing squelch (for military VHF use)
232	RS-232 Remote Control Interface
488	IEEE-488 Remote Control Interface
ASO	Audio Scan Output (audio output tone locked to received frequency)
BITE	Built In Test Equipment (2 versions, one with RF, one w/o)
CUR	Cursor (tuning knob moves cursor over spectrum display to show frequency)
DAV	Digital Audio Video (set audio and video output levels by digit control)
DFC	Direction Finder Control (for use with WJ-8971A direction finding unit)
DRD	Digitally Refreshed Display
EM	Extended Memory (96 channels - standard issue is 16)
FE	Frequency Extender (to 1.1 GHz)
FEX	Frequency Extender (to 1.2 GHz)
FP	Fan attachment (adds 2 muffin fans to rear and 3" to depth of radio)
HFE	High Frequency Extender (down to HF frequencies of 2 MHz)
IFBW	IF Bandwidth & discriminator sets (designation for any special IF/demods ordered)
ISB	Independent Sideband
LFE	Low Frequency Extender (down to LF frequencies of 100 kHz)
LOC	Lockout (allows locking out memories during scan)
LOGV	60 dB Log Video
M/S	Master/Slave (allows remote control by or of other radios)
NRT	Noise Riding Threshold (specialized squelch)
PAS	Programmable Antenna Switch (use tuning knob to set frequency in memory for automatic switchover of antennas)
PKC	Pluggable Keyboard Control (almost standard on 8617-8618 - look for IDC jack by tuning knob)
PRE	Preselector (** details not known **)
PSM	Panoramic/Sector Marker Display
PSS	** details not known **
RLOG	Record Logging
RCS	Rotating Chassis Slides (for rolling out of a rack and rotating for servicing)

RTC	Real Time Clock
SCS	Straight Chassis Slides (for rolling out of a rack mount)
SM	Spectrum Monitor (usually standard, the display on the front panel)
SMO	Spectrum Monitor Output (21.4 MHz)
SSB	Single Sideband Demodulator (USB and LSB w/ 3.2 kHz filters)
SSL	Sacn/Step/Lockout (advanced scanning features for 8615 only)
TPC	** details not known ***
TUN	Tuning (allows tuning by flashing display digit or standard 100Hz/10kHz/1MHz - standard on S1 versions)
VBFO	Variable Beat Frequency Oscillator
VLF	Very Low Frequency (covers 10kHz-500MHz - has a built-in downconverter activated below 6 MHz - cannot be installed with FE or FEX)
WBO	Wide Band Output (10MHz wide @ 21.4MHz for external demods)
WBO2	Wide Band Output 2 **details not known**

WJ-8616A, WJ-8617A and WJ-8618A Option Switches (on motherboard)

Table 2-1. Synthesizer Interface Switch Configurations

Switch S1 on A5A2 6 5 4 3 2 1	Description
1 - - - - - *	Frequency Range 20-1100 MHz
0 - - - - - *	Frequency Range 20-500 MHz
- 1 - - - -	Single Sideband
- 0 - - - -	Not Used
- - 0 0 0 0	Antenna Switches only by Front Panel Button
- - 0 0 0 1	Antenna Switches at upperband of 1st Preselector 30 MHz
- - 0 0 1 0	Antenna Switches at upperband of 2nd Preselector 47 MHz
- - 0 0 1 1	Antenna Switches at upperband of 3rd Preselector 75 MHz
- - 0 1 0 0	Antenna Switches at upperband of 4th Preselector 120 MHz
- - 0 1 0 1	Antenna Switches at upperband of 5th Preselector 187 MHz
- - 0 1 1 0	Antenna Switches at upperband of 6th Preselector 292 MHz
- - 0 1 1 1	Antenna Switches at upperband of 7th Preselector 382 MHz
- - 1 0 0 0	Antenna Switches at upperband of 8th Preselector 500 MHz
- - 1 0 0 1	Antenna Switches at 700 MHz
- - 1 0 1 0	Antenna Switches at 900 MHz
- - 1 0 1 1	Antenna Switches at 233 MHz

*1 0 0 0 0 0 Normal Shipping Positions (with FE installed)
*0 0 0 0 0 0 Normal Shipping Positions (without FE installed)

WJ-8617B(S1) and WJ-8618B(S1) Option Switches (on motherboard)

Table 2-1. Synthesizer Interface Switch Configurations

S1 switch settings are listed below:

Switch S1 on A5A2

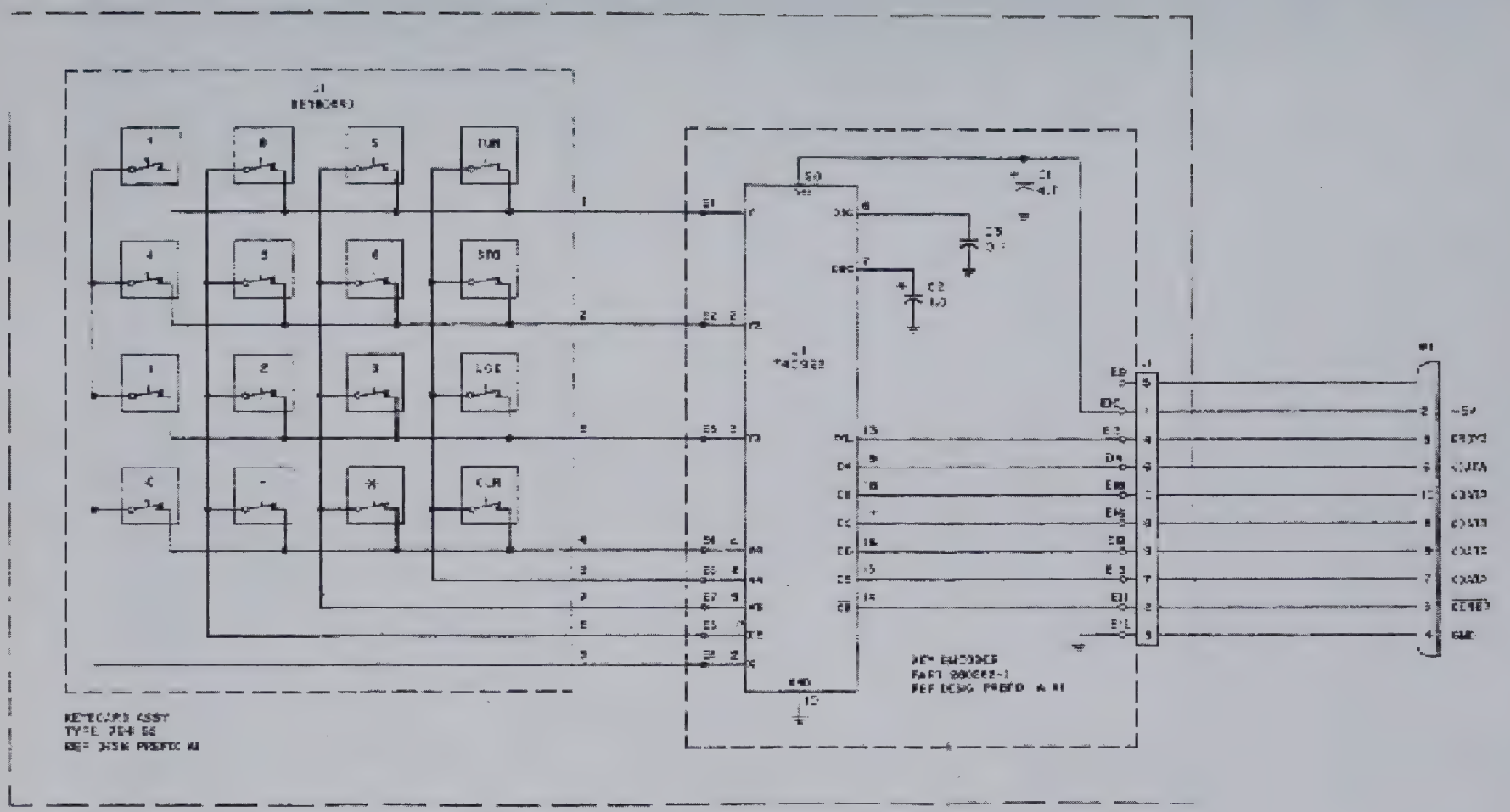
6	5	4	3	2	1	Function Selected
1	-	-	-	-	-	Selects Variable Tuning Resolution (from 100 Hz to 10 MHz)
0	-	-	-	-	-	Selects Normal Tuning Resolution (100 Hz, 10 kHz, 1 MHz only)
-	1	-	-	-	-	Selects Dual IF Amplifiers (up to 10 IF bandwidths)
-	0	-	-	-	-	Selects Single IF Amplifiers (up to 5 IF bandwidths)
-	-	*	-	-	-	Spare (for future expansion)
-	-	-	*	-	-	Spare (for future expansion)
-	-	-	-	1	-	Enables SSB Option
-	-	-	-	0	-	Disables SSB Option
-	-	-	-	-	1	Frequency Extender Option Installed
-	-	-	-	-	0	Frequency Extender Option Not Installed

S2 switch settings are listed below:

Switch S2 on A5A2

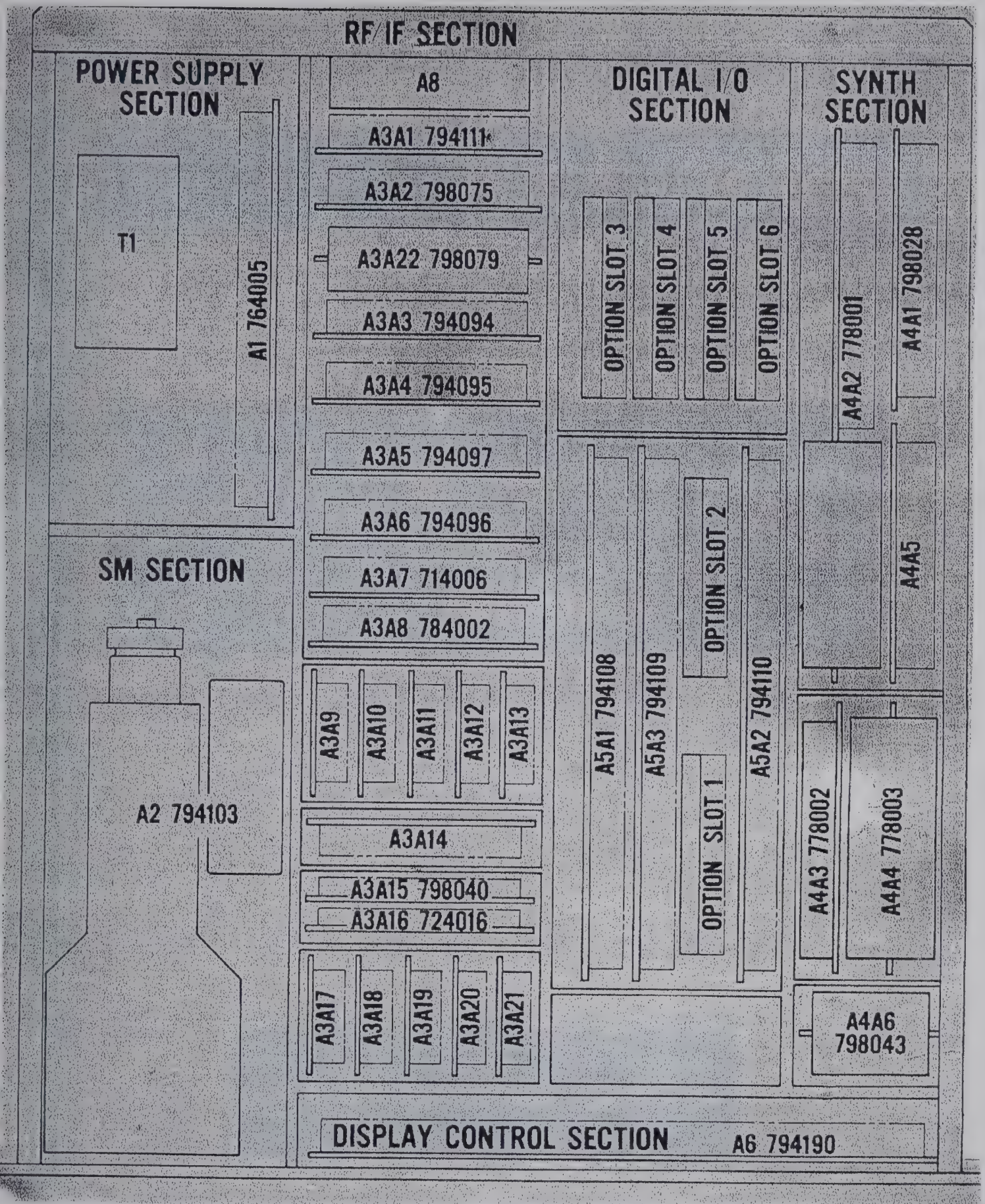
8	7	6	5	4	3	2	1	Function Selected
*	-	-	-	-	-	-	-	Spare (for future expansion)
-	1	-	-	-	-	-	-	Pre-dwell Selected
-	0	-	-	-	-	-	-	Post-dwell Selected
-	-	1	-	-	-	-	-	NRT Disabled
-	-	0	-	-	-	-	-	NRT Enabled
-	-	-	*	-	-	-	-	Spare (for future expansion)
-	-	-	-	*	-	-	-	Spare (for future expansion)
-	-	-	-	-	1	-	-	LOG 40 dB LOG Scale Selected
-	-	-	-	-	0	-	-	LOG 60 dB LOG Scale Selected
-	-	-	-	-	-	*	-	Spare (for future expansion)
-	-	-	-	-	-	-	*	Spare (for future expansion)

NOTE: 1 = OPEN
0 = CLOSED
* = NOT USED

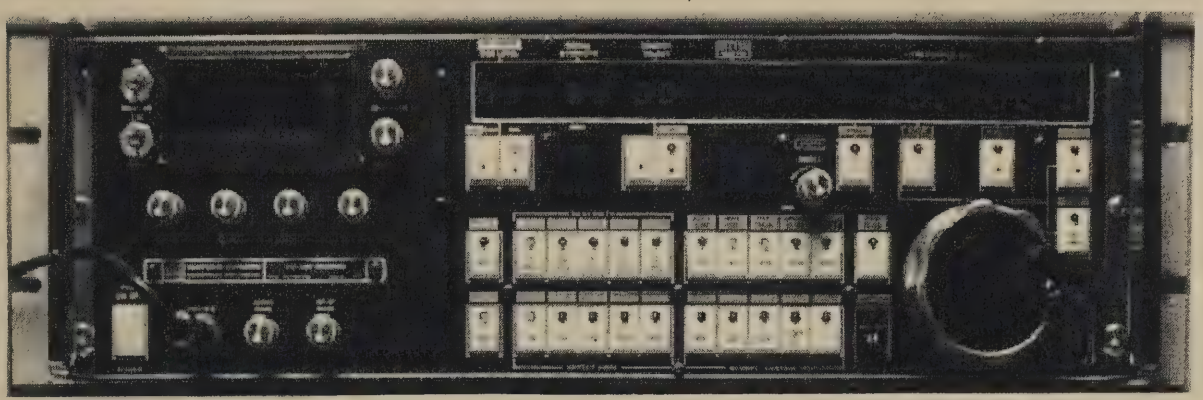


PKC - Plug-in Keypad Controller

Building this circuit and plugging it into the front panel of your WJ-8617 or WJ-8618 receiver will add direct keypad entry with memory control (a welcome feature). I've built this and it works great. A higher resolution version of this schematic is available in the Schematics section of the Premium RX website.

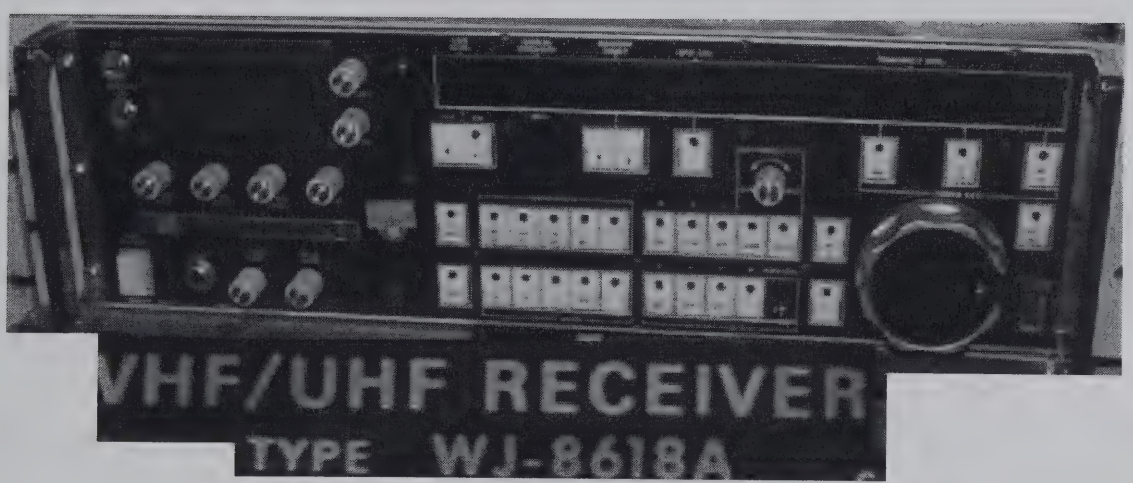

RF/IF SECTION
POWER SUPPLY SECTION
T1
A1 764005
SM SECTION
A2 794103
A8
A3A1 794111
A3A2 798075
A3A22 798079
A3A3 794094
A3A4 794095
A3A5 794097
A3A6 794096
A3A7 714006
A3A8 784002
A3A9
A3A10
A3A11
A3A12
A3A13
A3A14
A3A15 798040
A3A16 724016
A3A17
A3A18
A3A19
A3A20
A3A21
DIGITAL I/O SECTION
OPTION SLOT 3
OPTION SLOT 4
OPTION SLOT 5
OPTION SLOT 6
A5A1 794108
A5A3 794109
OPTION SLOT 2
OPTION SLOT 1
A5A2 794110
SYNTH SECTION
A4A2 778001
A4A1 798028
A4A5
A4A3 778002
A4A4 778003
A4A6 798043
DISPLAY CONTROL SECTION
A6 794190

Tech-notes



WJ-8618B(S1) VHF/UHF Receiver

WATKINS-JOHNSON


VHF/UHF RECEIVER
TYPE WJ-8618A

WJ-8618A, WJ8618B & WJ-8618B(S1) Configurations 06-03-04

WJ-8618A Receiver Versions

WJ-8618A Status=
Receiver with 20-1100 MHz coverage designed to meet stringent EMI/RFI specifications.

WJ-8618A-1 Status = M 8/14/80
Same as WJ-8618A without signal monitor.

WJ-8618A-3 Status = M 8/14/80
WJ-8618A with blank front panel. This is for remote control and unit must have IEEE-488 or RS-232C option installed.

WJ-8618A-4 Status = M 12/16/82
Same as WJ-8618 with pulse stretching added. SIS/WTE.

WJ-8618B Receiver Versions

WJ-8618B-1 Status = 3/83
Same as WJ-8618B except new software allowing modified scan and special subroutines upon detection of signals. Added front panel upper case functions for "scan down" and complete "scan" activation from 1100 MHz down to 20 MHz.

WJ-8618B-2 Status = 7/83
WJ-8618B modified for use with WJ-9195 DRD unit. "MULTARS" special software. See file for complete details of program.

WJ-8618B-3 Status =
WJ-8618B with blank front panel. This is for remote control and unit must have IEEE-488 or RS-232C option installed.

WJ-8618B-4 Status = 11/83
SSQ-80 receiver spec. keys, mnemonics and software changes.

WJ-8618B-6 Status = 12/8/83
Master/slave LO outputs. Special group delay equalized filters. 50 kHz, 400 kHz, 800 kHz, 2 MHz, 4 MHz. Similar to WJ-8617B-6 but with normal front panel controls.

WJ-8618B-7 Status = 4/84
LSB (J28) and USB (J29) available on the rear panel. Spare fuseholder removed and "WB-IF OUT" installed in that position.

WJ-8618B-8 Status= 5/84
Modified software and 794137-8 extended control subassembly adds seven uppercase functions to front panel pushbuttons (labeled A through G). Frequency display and tuning knob active in scan mode, with frequency display changing only with knob rotation. See files for complete information.

WJ-8618B-9 Status = 7/84
10IF option increases IF bandwidths available to ten. Variable tuning resolution similar to WJ-8615D. See file for further details.

WJ-8618B-10 Status = 10/84
VHF/UHF receiver. Same as WJ-8618B except includes BCD parallel output of tuning frequency and selectable internal or external local oscillator, RS-232.

WJ-8618B-11 Status = 2/85
Same as WJ-8618B except modified to contain master-slave/local (MS/LO) capabilitiy

WJ-8618B-12 Status = 11/1/85

Same as WJ-8618B-10 except has IEEE-488 instead of RS-232 communications. No external LO capability. 10 IF bandwidths, 10 MHz IF bandwidth (4 MHz/8 MHz BW is a special). Note: does not include RTC and RLOG.

WJ-8618B-12 Revs. 1, 2, 3, & 4 1/13/86
Differences not listed.

WJ-8618B-13 Status = 12/10/85
Same as WJ-8618B-12 which has IEEE-488, parallel BCD output, 10 IF bandwidths. Also adds built-in tracking preselector. Supports 10 MHz IF bandwaidth and RLOG.

WJ-8618B-14 Status = 1/86
WJ-8618B changed to include: BCD parallel output of tuning frequency in option slot 6; RLOG in option slot 5; RTC in option slot 1; No external LO; 10 IF bandwidths supported up to 10 MHz IF bandwidth (4 MHz/8 MHz IF BW is special); Known options not supported: RS-232C interface; ASO; NRT; LOGV; BITE.

WJ-8618B-14 Rev 1 2/86
Differences not listed.

WJ-8618B-15 Status = 6/4/86
Same as WJ-8618B except modified for use with WJ-9195 DRD unit and to incorporate software changes per GTE specifications indicated on OA #300987, "High Noon" receiver. Enables receiver to work with WJ-9195 control unit. (See WJ-8168B-2 type number assignment form for details of WJ-9195 DRD modifications). Options supported: M/S, BITE, 488, WBO, FE, SM. (Has been seen with E-Systems tag and a light green front panel).

WJ-8618B-15 Rev. 1 7/86
MS is not a supported option.

WJ-8618B-16 Status = 6/11/86
Similar to WJ-8617B with modified software to bias display frequency with respect to actual tuned frequency. All units have 10 IF bandwidths and buttons. New name plate. Nerate CPL. Also included: (1) 10 IF BWS selectable up to and including 10 MHz; (2) IF BWS supplied are: 10, 20, 50,100, 250, 500 kHz AND 1, 2, 4, and 10 MHz. Consult engineering regarding: algorithm of frequency offset; Options supported; 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO-2, FE, SSB, SM, NRT, LOGV, HFE. OA

WJ-8618B-16 Rev 1. 6/19/86
Differences not listed.

WJ-8618B(S1) Receiver Versions

WJ-8618B(S1) Status = 4/85
New microprocessor card using 8609. Not backward compatible with old units. (Latest major software updates included).

WJ-8618B-17 Status = 8/4/86
VHF/UHF receiver with modifications for the "Euphoria" program: (1) AGC dump; (2) Allow SRQ after frequency change if signal is present; (3) Decrease AGC attck time; (4) changed FM filter on interface board (AFC/FMO?)(Decreased time constant on FMDC); (5) software change to allow receiver to tune to "zero" frequency. Requested options: BITE, 488, SSB, SM, 10K, 20K, 50K, 300K, FP, AND SCS.

WJ-8618B-18 Status = 11/86
Same as current WJ-8618B(S1) except modified to control WJ-9075 1-4.5 GHz frequency extender. With WJ-9075 enabled, tuning above 1000 MHz is accomplished through the use of extender as down converter for signals in the 1 - 4.5 Ghz range. With extender disabled, receiver will functions as standard WJ-8618B(S1). Options supported: TUN, M/S, 10IF, RLOG, BITE, VBFO, PKC, DRD, PSM, 488, WBO, FE, SSB, SM, DFC, IFBW, HFE, LFE, RTC,10MHZ. Options excluded: VLF, NRT, PRE, TPC. Consult engineering for information on LOGV, 232, ASO.

WJ-8618B-18 Rev 1. 3/88
Indicates TUN is now standard.

WJ-8618B-19 Status = 7/87
WJ-8618B receiver modified to operate with WJ-9073-2 tracking preselector. Installation of serial interface in option slot 5 or 6 precludes the use of certain options depending upon which option slot is used. Consult engineering on the use of the following options: RLOG, DAV, ASO. Options supported: TUN, 10IF, BITE, VBFO, PKC, DRD, PSM, 488, 232, WBO, FE, ISB, SSB, SM, DFC, IFBW, LOGV, RTC, 10MHz, TPC, SCS, and FP. Consult engineering on M/S, RLOG, ASO, HFE, LFE, DAV.

WJ-8618B-20 Status = 10/88
Same as WJ-8618B(S1) except digital motherboard is wired to support the NRT option. Digital motherboard type number is 798039-13, schematic number is 580515. Note: the DAV option will not work in this receiver. OA #302500/BEAM.

WJ-861x Receiver Options

06-03-04

The WJ-8615, WJ-8617 and WJ-8618 receivers vary wildly in configuration, options, and coverage. The codes are the same for all receivers but the options themselves require different boards and, in some cases, different software versions for different radios.

Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

10IF	Ten IF (receiver has ten slots for IFs and Demods 8617-8618 only)
10MHz	10 MHz maximum IF bandwidth (8 MHz is standard)
150Hz	150Hz tone sensing squelch (for military VHF use)
232	RS-232 Remote Control Interface
488	IEEE-488 Remote Control Interface
ASO	Audio Scan Output (audio output tone locked to received frequency)
BITE	Built In Test Equipment (2 versions, one with RF, one w/o)
CUR	Cursor (tuning knob moves cursor over spectrum display to show frequency)
DAV	Digital Audio Video (set audio and video output levels by digit control)
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FEX	Frequency Extender (to 1.2 GHz)
FP	Fan attachment (adds 2 muffin fans to rear and 3" to depth of radio)
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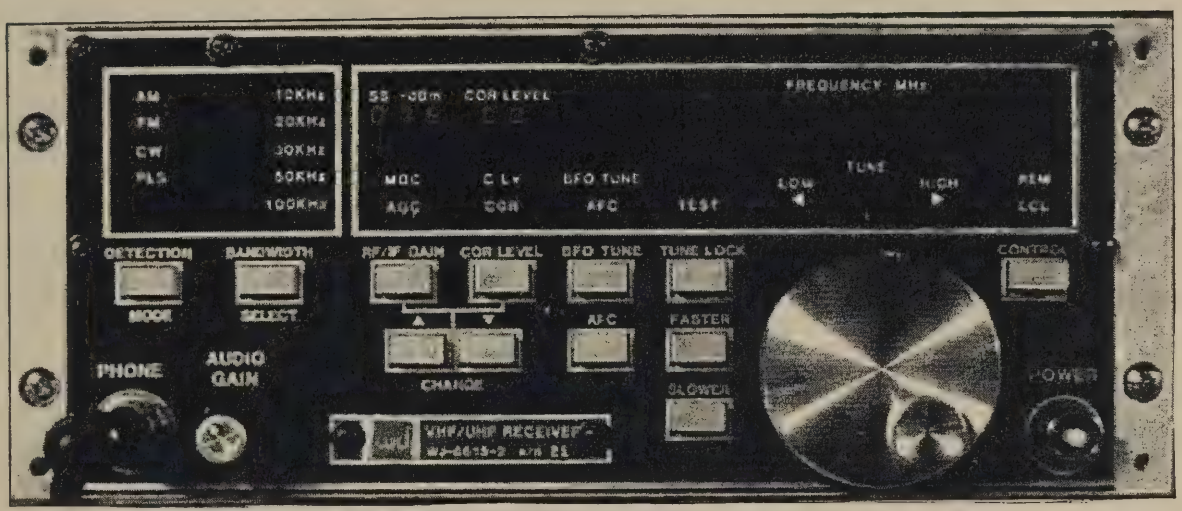
IFBW	IF Bandwidth & discriminator sets (designation for any special IF/demods ordered)
ISB	Independent Sideband
LFE	Low Frequency Extender (down to LF frequencies of 100 kHz)
LOC	Lockout (allows locking out memories during scan)
LOGV	60 dB Log Video
M/S	Master/Slave (allows remote control by or of other radios)
NRT	Noise Riding Threshold (specialized squelch)
PAS	Programmable Antenna Switch (use tuning knob to set frequency in memory for automatic switchover of antennas)
PKC	Pluggable Keyboard Control (almost standard on 8617-8618 - look for IDC jack by tuning knob)
PRE	Preselector (** details not known **)
PSM	Panoramic/Sector Marker Display
PSS	** details not known **
RLOG	Record Logging
RCS	Rotating Chassis Slides (for rolling out of a rack and rotating for servicing)

RTC	Real Time Clock
SCS	Straight Chassis Slides (for rolling out of a rack mount)
SM	Spectrum Monitor (usually standard, the display on the front panel)
SMO	Spectrum Monitor Output (21.4 MHz)
SSB	Single Sideband Demodulator (USB and LSB w/ 3.2 kHz filters)
SSL	Sacn/Step/Lockout (advanced scanning features for 8615 only)
TPC	** details not known ***
TUN	Tuning (allows tuning by flashing display digit or standard 100Hz/10kHz/1MHz)
VBFO	Variable Beat Frequency Oscillator
VLF	Very Low Frequency (covers 10kHz-500MHz - has a built-in downconverter activated below 6 MHz - cannot be installed with FE or FEX)
WBO	Wide Band Output (10MHz wide @ 21.4MHz for external demods)
WBO2	Wide Band Output 2 **details not known**

Tech-notes



WJ-8615 receivers

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WJ-8615 receivers

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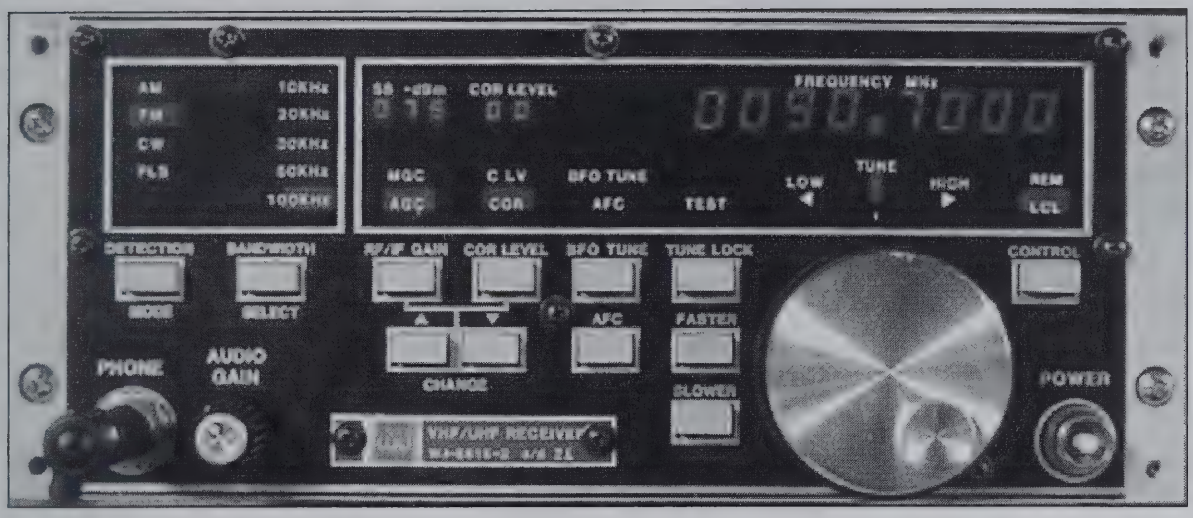


The WJ-8615 receiver is another flexible architecture receiver that comes in many different configurations. It is 3-1/2" high and 1/2 rack width. There are substantial internal differences between the plain, -2, D and P versions.

More to follow

WJ-8615 configuration guide - entire series

WJ-8615 available options

WJ-861x Receiver Options

06-03-04

The WJ-8615, WJ-8617 and WJ-8618 receivers vary wildly in configuration, options, and coverage. The codes are the same for all receivers but the options themselves require different boards and, in some cases, different software versions for different radios.

Cannibalization is rampant. An option code on the rear panel or a configuration dash number is only an indication of the original state of the radio. Always check internally for appropriate option cards, filters, connectors and functions before assuming the radio has what is marked on the outside.

10IF	Ten IF (receiver has ten slots for IFs and Demods 8617-8618 only)
10MHz	10 MHz maximum IF bandwidth (8 MHz is standard)
150Hz	150Hz tone sensing squelch (for military VHF use)
232	RS-232 Remote Control Interface
488	IEEE-488 Remote Control Interface
ASO	Audio Scan Output (audio output tone locked to received frequency)
BITE	Built In Test Equipment (2 versions, one with RF, one w/o)
CUR	Cursor (tuning knob moves cursor over spectrum display to show frequency)
DAV	Digital Audio Video (set audio and video output levels by digit control)
DFC	Direction Finder Control (for use with WJ-8971A direction finding unit)
DRD	Digitally Refreshed Display
EM	Extended Memory (96 channels - standard issue is 16)
FE	Frequency Extender (to 1.1 GHz)
FEX	Frequency Extender (to 1.2 GHz)
FP	Fan attachment (adds 2 muffin fans to rear and 3" to depth of radio)
HFE	High Frequency Extender (down to HF frequencies of 2 MHz)
IFBW	IF Bandwidth & discriminator sets (designation for any special IF/demods ordered)
ISB	Independent Sideband
LFE	Low Frequency Extender (down to LF frequencies of 100 kHz)
LOC	Lockout (allows locking out memories during scan)
LOGV	60 dB Log Video
M/S	Master/Slave (allows remote control by or of other radios)
NRT	Noise Riding Threshold (specialized squelch)
PAS	Programmable Antenna Switch (use tuning knob to set frequency in memory for automatic switchover of antennas)
PKC	Pluggable Keyboard Control (almost standard on 8617-8618 - look for IDC jack by tuning knob)
PRE	Preselector (** details not known **)
PSM	Panoramic/Sector Marker Display
PSS	** details not known **
RLOG	Record Logging
RCS	Rotating Chassis Slides (for rolling out of a rack and rotating for servicing)

RTC	Real Time Clock
SCS	Straight Chassis Slides (for rolling out of a rack mount)
SM	Spectrum Monitor (usually standard, the display on the front panel)
SMO	Spectrum Monitor Output (21.4 MHz)
SSB	Single Sideband Demodulator (USB and LSB w/ 3.2 kHz filters)
SSL	Sacn/Step/Lockout (advanced scanning features for 8615 only)
TPC	** details not known ***
TUN	Tuning (allows tuning by flashing display digit or standard 100Hz/10kHz/1MHz)
VBFO	Variable Beat Frequency Oscillator
VLF	Very Low Frequency (covers 10kHz-500MHz - has a built-in downconverter activated below 6 MHz - cannot be installed with FE or FEX)
WBO	Wide Band Output (10MHz wide @ 21.4MHz for external demods)
WBO2	Wide Band Output 2 **details not known**

Watkins Johnson 8615 series VHF/UHF - Receiver Versions 06-03-04

Note: Exact version is displayed in digital display for a few seconds at power-up

Version format XX.YY where
XX represents the Type **YY represents the Revision (0-99)**

Type

Type AA	WJ-8615	Amended "A" version used only with A.08 and AA.08
Type A	WJ-8615	Standard 8615 software
Type D	WJ-8615D	Standard 8615D software
Type E	WJ-8615/SSL	8615 with Scan/Step/Lockout option*
	WJ-8615D/SSL	8615/D with Scan/Step/Lockout option*
Types F & FD		No additional information available

* Scan/Step/Lockout adds associated scan functions and enables WJ-8610A controller to gather spectrum displays for system integration

Revision (software)

Original software was A.0 and has been revised a number of times. A brief overview follows:

Ver A.0.3
Rx power up sequence modified to improve 1st LO lock-up at all frequencies.
Gain normalization tables contained in RAM, were implemented to increase gain normalization across varying bandwidths.

Ver A.0.4
Tuning meter modified to accommodate spectrum reversal with implementation of Frequency Extender (FE) option and receiver is tuned above 500MHz

Ver A.0.5
Digital control section signature analysis subroutine relocated in memory, to provide increased reliability in the analysis results.

Ver A.0.6
Tuning meter subroutines modified to prevent meter self-centering after reaching endstop - eliminates false center readings.
2nd LO tuning subroutine modified for net increase in tuning lock speed.
Other modifications allow for recognition of following IF bandwidths: 3.2KHz, 15KHz, 30KHz, and 250KHz. Also bandwidth sizing is provided for SSB operation, allowing auto selection of the 1st IF bandwidth greater than 6.4KHz when in SSB mode.

Ver A.0.7

Calibration subroutine added to operating system that generates a data table in RAM, providing optimum tuning of the 2nd LO synthesizer. This provides faster and more reliable 2nd LO synthesizer operation. Fifteen minutes after power-up, the 2nd LO CAL routine is executed. During the first 15 minutes of operation, the 2nd LO uses fixed ROM data. During a 2nd LO CAL operation, "2nd CAL" is displayed and front panel operation is disabled. Front panel operation is restored when 2nd LO CAL is completed.

The Front Panel Definitions mode allows the 2nd LO CAL routine to be enabled (2CAL ON) or disabled (2CAL OFF). When enabled, the 2nd LO uses data tables generated in RAM as a result of the 2nd CAL routine; when disabled, the 2nd LO uses fixed data tables factory loaded in ROM. Additional error codes have been added to service the 2nd LO CAL routine.

Ver A.0.8

The 488 busy bit is set while receiver is responding to a query. Additionally, the Master Receiver does not respond to selection of SSB or ISB if the slave receiver is not so equipped. Previously, this caused 488 control lockup.

Note: ***Due to the hardware changes required to support SSL, version A.0.9 and later are not backward compatible with previous versions.***

Ver A.0.9

Step-Scan-Lock options are supported beginning with this revision.

Tuning meter operation is modified to allow half-step operation (manifested by illumination of two bars at various levels)...this tends to smooth the relationship between tuning meter readout and actual tuned position within bandpass.

Manual gain control limits are indicated with "--" at either end of the control range.

Automatic IF bandwidth control has been refined. Selecting SSB mode causes receiver to search installed filters to locate the the narrowest filter (equal or greater than 6.4KHz) regardless of its location. When exiting SSB mode, the bandwidth previously in use is reselected.

In Front Panel Definitions Mode, a mode change now requires a full 45 degree rotation of the tuning knob. This desensitizes this adjustment, requiring deliberate effort to effect a change.

The BFO and COR buttons toggle their associated functions on/off.

Pressing the BFO key while in CW or SSB or ISB, causes the BFO offset setting to replace the tuned frequency display. Pressing the BFO key again restores the frequency readout at its previous tuning resolution.

With COR enabled, the CHANGE pushbuttons vary the COR level.

In the TEST mode, the operator may observe actual synthesizer frequency in the tuning display for diagnostic purposes.

488 revisions include elimination of inconsistent responses to signal strength queries.

Commands and queries may now be formatted as strings, each command separated by a semi-colon. The receiver responds in same format.

Version A1.1/D1.1
Modified version of the A1.0/D1.0 software.
AGC AM detector is now 2V pk, allowing fast AGC. The AGC sample window is now 30msec.
In binary 488 mode, the semi-colon is removed from the VER? query.

Ver A.1.1
Software version may be used in either processor type in the 796242 assembly in U3 and U4, or in type 796495 processors in U9.

Ver D.0.9
Standard software based on ver A.0.9, incorporating SSL.

Ver D.1.0
The CAL2 operation was modified to allow operator to interrupt a Scanning calibration.
The Fast Scan LO (FSLO) and Extended Memory (EM) have been incorporated. BFO tuning can be exited by pressing any tune-related key.

Ver E.0.3
Version based on D.0.9 allows LOK command to lock out twice the selected IF bandwidth.
LCK and RLK commands require a question mark (?). SRQ is set after data is entered into the queue.

Ver E.0.4:
Version based on D.1.0. Changes as follows:
Scan parameters when going from Scan to Manual Scan. The sync pulse timing has been adjusted to maintain specified limits during the extra time required for the 5KHz interpolation.
It provides a calibration check at power-up, preserves receiver mode through power-down/up, and has added the SCM (Scan Manual) and STM (Step Manual) commands.

Ver E.0.5
Scan dwell time has been increased to 150msec during scan, allowing sufficient 2nd LO lock time when a signal greater than COR level is encountered.
The CLM command now only clears memory.
The BIN command is allowed during Step or Scan mode.

Ver E.0.6
Version based on E.0.5. Provides following additional capabilities:
The "start-of-sync-pulse" is enabled at the start of Scan; the BFO sign bit (+/-) is saved in channel memory.
The COR bit (in the status byte) is reset when a Scan or Step command is set and the CAL abort flag has been added.

Ver E.0.7
Implements new Calibration timers for @nd LO CAL routines.

Ver E.1.0
Allows processor type 796495-5 to provide EPROM selectable options.
Software selectable options are SSL and EM.

Ver E.2.0
Version based on E.0.4 for SSL: allows tuning to ZERO and provides LO lock check routine.

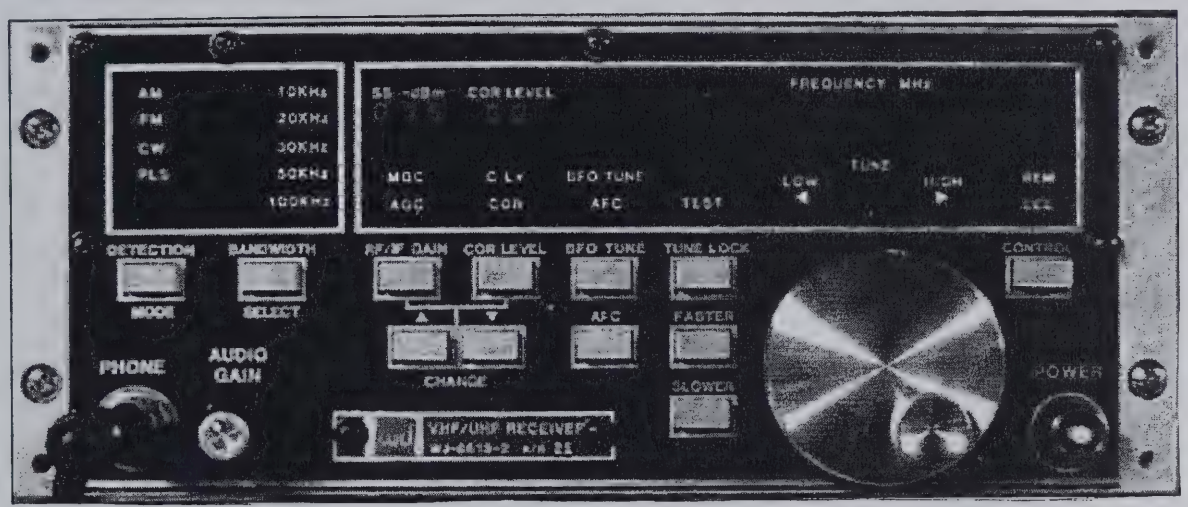
Ver F0.0.0
Special version based on ver E.0.6:
Resets COR output when Scan or Step command is received.

Ver FD.0.1
Special version
Provides a SSL routine (no further info found).

Ver FD.0.7
Allows option to cause signal acquisition by edge triggering, thus avoiding duplicate lockons possibly off-center tuned. (no further info found).

Ver FD.0.9
Added Auto Cal and Scan Increment subroutines in operating software.

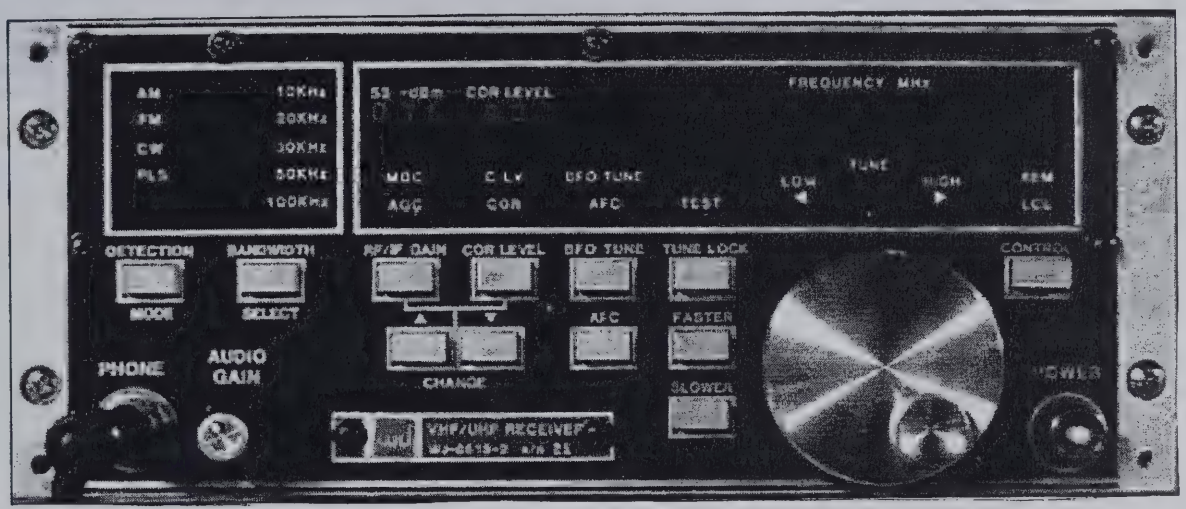
Tech-notes



WJ-8615 receivers

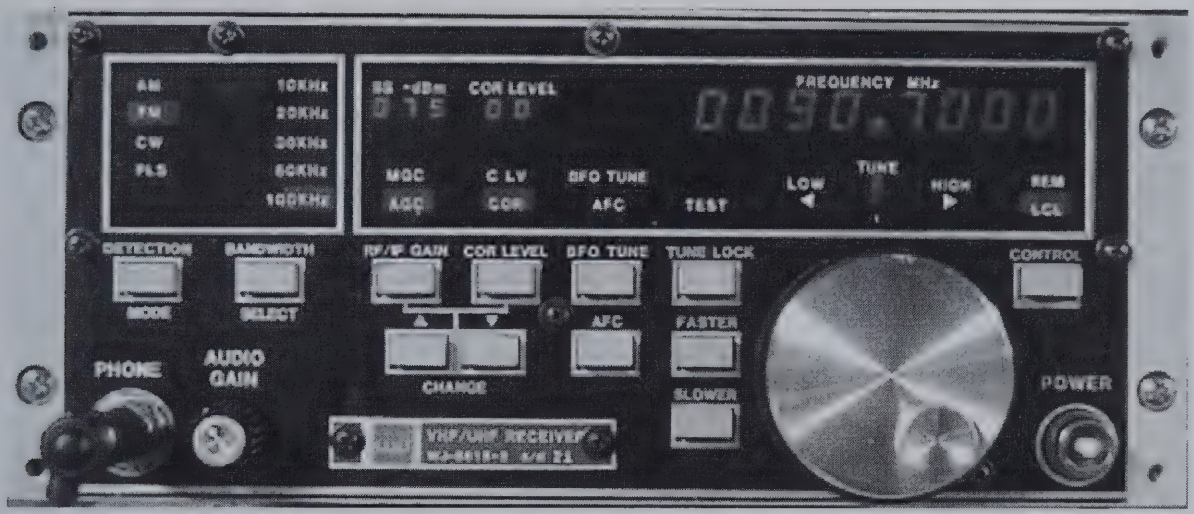
WATKINS-JOHNSON

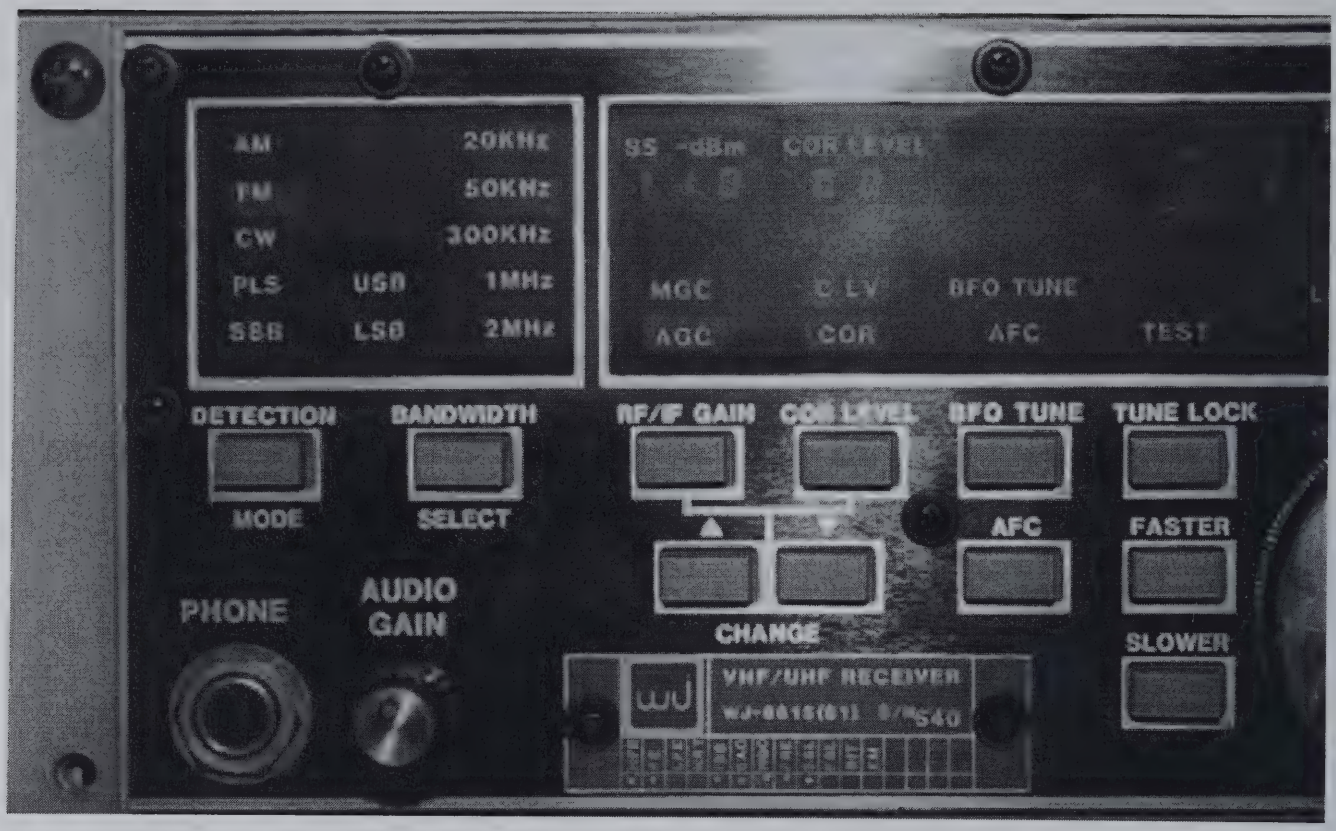
Tech-notes



WJ-8615 receivers

WATKINS-JOHNSON


AM
FM
CW
PLS
10KHz
20KHz
30KHz
50KHz
100KHz
SS -dBm
COR LEVEL
FREQUENCY MHz
MQC
C LV
BFO TUNE
TEST
LOW
TUNE
HIGH
REM
AGC
COR
AFC
LCL
DETECTION
MODE
BANDWIDTH
SELECT
RF/IF GAIN
COR LEVEL
BFO TUNE
TUNE LOCK
CONTROL
CHANGE
AFC
FASTER
SLOWER
PHONE
AUDIO GAIN
POWER

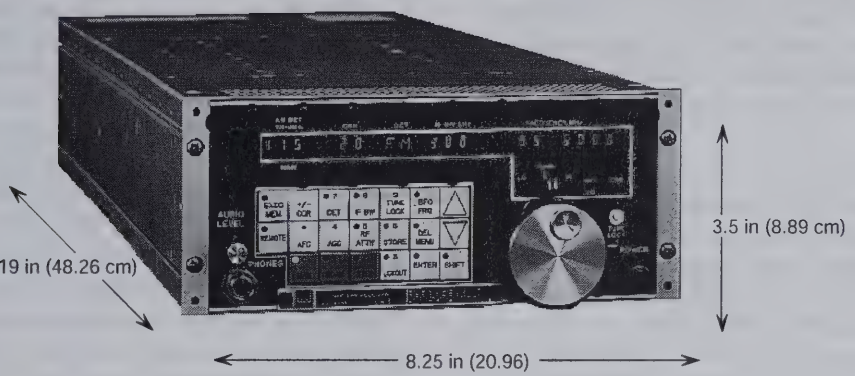

AM 20KHz
FM 50KHz
CW 300KHz
PLS USB 1MHz
SSB LSB 2MHz
SS -dBm COR LEVEL
MGC C LV BFO TUNE
AGC COR AFC TEST
DETECTION
MODE
BANDWIDTH
SELECT
RF/F GAIN
COR LEVEL
BFO TUNE
TUNE LOCK
AFC
FASTER
CHANGE
SLOWER
PHONE
AUDIO GAIN
VHF/UHF RECEIVER

Technical Data

WATKINS-JOHNSON

October 1995

VHF/UHF Compact Receiver
WJ-8615P



Description

The WJ-8615P microprocessor-controlled receiver monitors or searches the 20 to 500 MHz frequency range. Two units, mounted side-by-side, fit into a standard 19-inch (48.26 cm) equipment rack, occupying only 3.5 inches (8.89 cm) of vertical rack space.

Fully synthesized Local Oscillators (LO) allow accurate tuning throughout the 20 to 500 MHz tuning range, with a 100-Hz tuning resolution. Frequency coverage is expandable from 2 to 1600 MHz with frequency extender (FEX) options. Three IF bandwidths (IFBW) ranging from 3.2 kHz to 8 MHz come with the unit. Two additional bandwidths are readily accepted, giving a total of five selectable IFBWs. AM, FM, CW and Pulse detection modes are standard. Independent Sideband (ISB) for upper, lower, or simultaneous upper and lower sideband detection is optional.

The front panel features an LED alphanumeric window and backlit keypad, allowing dark room operation. During routine operation, the window displays:

- Signal strength
- COR threshold level
- Detection mode
- IF bandwidth
- Tuned frequency

Features

- *Frequency range: 20 to 500 MHz (2 to 1600 MHz with FEX)*
- *Compact size*
- *High dynamic range*
- *Modular construction*
- *Microprocessor-control*
- *AM, FM, CW, Pulse & optional ISB modes*
- *Battery backed-up memory, clock & calendar*
- *IEEE-488 bus compatible, talk/listen*
- *Low close-in phase noise*
- *3 standard IFBWs from 3.2 kHz to 8 MHz*
- *Front panel & remote control*
- *Log of signal acquisition with date & time to RS-232 printer or audio tape*
- *Simultaneous output of demodulated audio & log data formatted for 2-channel audio recorder*
- *Handoff of front-panel setup to other receivers*
- *Optional built-in tracking preselector*
- *Low in-band intermodulation products*

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Printed in the U.S.A.

Specification subject to change without notice.

An operator can tune the receiver using the tuning wheel or numeric keypad. Frequently changed parameters are adjusted using the increment (INC)/ decrement (DEC) keys or numeric keypad.

Parameters that require occasional adjustment are accessed by clearly labeled menus. Decisions are easily reviewed, changed or cancelled while in the menu. The receiver prompts the operator and prevents selection of illegal parameters. The display also warns of operator errors and helps to locate hardware failures.

The WJ-8615P scan-step-lockout functions allow an operator to step through a sequence of preprogrammed discrete frequencies in search of signal activity. In either the scan or step mode, signals greater than the programmed COR level will halt the sequence. Depending on its current configuration, a receiver may remain at that frequency for a time or simply log the signal into its internal queue, or to an external printer, before resuming the sequence. If configured differently, the receiver may halt the sequence until a signal has disappeared, or dwell after the signal has disappeared. This allows time to monitor a push-to-talk response. The WJ-8615P Receiver includes 150 channels of battery backed-up memory for storing scan and step parameters. An operator can partition these 150 memory channels between scan and step channels to optimize available memory space.

Associated with scan mode, the lockout feature permits an operator to exclude portions of the frequency segment to prevent undesired signals from interrupting the scan. The menu allows an operator to enter lockouts by tuning the receiver, and finding the lower and upper boundaries of an unwanted signal. The unit provides 300 memory locations for lockout storage.

Logging is a standard WJ-8615P feature that provides a permanent record of signal activity without host supervision and with a minimum of external equipment. When enabled, a serial port sends detailed information about each intercepted signal to an RS-232 compatible printer or terminal. The printer shows the date and time a scan or step sequence is initiated, and provides a description of the new sequence. The unit then logs each acquired signal by date, time, frequency, and signal strength.

The WJ-8615P also outputs log data in FSK format for direct recording onto audio tape. The receiver can record demodulated signals on one channel of a two-channel tape recorder with log data on the other channel. The unit tags each signal with date, time, frequency, signal strength, and other parameters. Later, when tapes are analyzed, an operator can use a WJ-9863 Decoder to extract the FSK data from the cassette and convert it to RS-232 format. The WJ-9863 connects a tape playback machine to a terminal or printer, which displays the log of each signal during playback.

Handoff is also a standard feature that links one WJ-8615P to as many as 29 WJ-8615P or WJ-8607 Receivers. The serial, bi-directional Handoff Net allows the local operator of any WJ-8615P to send a handoff message to any other receiver, and set it to the same frequency and front-panel parameters. By using the Handoff Net, an operator of a single receiver can scan or step almost continuously, pausing only long enough to hand off signals of interest to other receivers.

Figure 1 shows how the Handoff Net can connect stand-alone receivers or receivers that are otherwise connected using an IEEE-488 bus. A single Handoff Net can connect selected receivers from many different IEEE-488 buses. This access to receivers outside an immediate system optimizes equipment use and multiplies emergency backups.

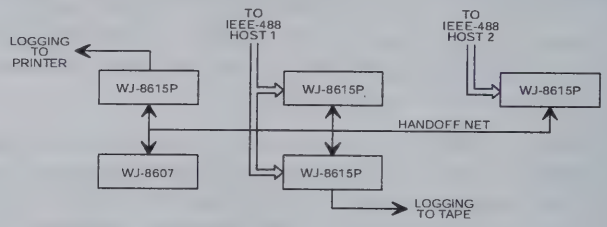

Figure 1. Receiver Handoff Net

Functional Description

Figure 2 illustrates how an operator can use the 20 to 500 MHz basic receiver without any preselection. A tracking preselector option provides improved intermodulation performance for both second- and third-order intermodulation products. An operator can tune in the 500 to 1600 MHz range by using optional FEX modules that contain the UHF synthesizer, downconverter, and a three-band preselector. The unit processor downconverts UHF (450 to 250 MHz) as VHF.

A single plug-in module contains the VHF preamplifier, first converter, first IF, and second converter that are required to convert 20 to 500 MHz signals to an IF frequency of 21.4 MHz. The first mixer converts the 20 to 500 MHz RF signal to 555 MHz with a first LO tuning frequency range 577.50 to 1057.50 MHz in 5-MHz steps. The first IF is centered at 555 MHz and

is approximately 12-MHz wide. The second LO, which is also synthesized, tunes from 536.10 to 531.10 MHz in 100-Hz steps to convert the first IF from 555 MHz to 21.4 MHz.

An IFBW filter module accepts up to five IFBW filters. After an operator selects the final IFBW, the receiver predetects the IF signal, then amplifies and routes it to AM, FM and CW Demodulators, as well as to an optional ISB module providing both upper and lower SSB demodulation.

The WJ-8615P microprocessor does more than simply interface front-panel controls and the remote control bus to receiver circuits. The unit also monitors all receiver detectors via Analog to Digital (A/D) inputs to the receiver interface module. Functions such as AGC, AFC and COR are derived in software.

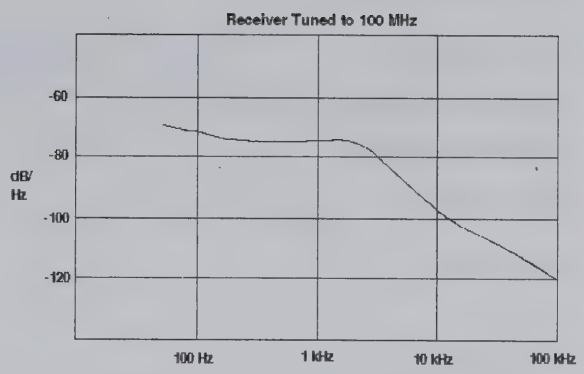

Figure 3. Typical Receiver Phase Noise

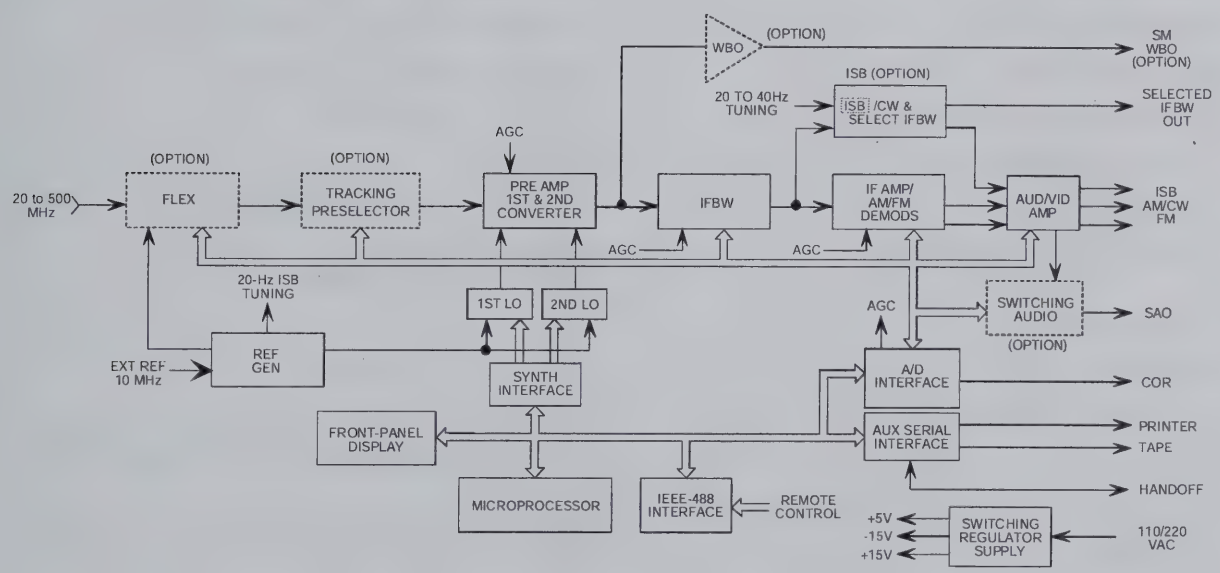

Figure 2. WJ-8615P Receiver Functional Block Diagram by Module

Specifications

Frequency Range	20 to 500 MHz (2 to 1600 MHz with FEX)
Frequency Resolution	100 Hz, synthesized
RF Input Impedance	50 ohms, nominal
Input VSWR	2.5:1 typ 3:1, max
Noise Figure	8 dB, max (12 dB, 500 to 1200 MHz with FEX) Add 1.5 dB for FEX option (2 to 500 MHz) Add 2.5 dB for Tracking Preselector option (2 to 500 MHz)
Intermodulation:	
2nd-order Intercept Point	+20 dBm, min (+45 dBm typical with preselector, except 2 to 20 MHz)
3rd-order Intercept Point	0 dBm, min (+3 dBm with preselector)
Internal Frequency Accuracy	$\pm 1X10^{-6}$ (0 to 50°C)
External Reference Input	10 MHz at 0 dBm nominal
Image Rejection	90 dB, min
Final IF Rejection (21.4 MHz)	90 dB, min above 30 MHz
LO Phase Noise	-100 dBc/Hz at 20 kHz from Fc
Tuning Speed	10 msec, max to within 10 kHz
Signal Monitor Output	15 dB above RF input (WBO option -30 dBm out)
Gain Control Modes	Manual; Automatic; 100 dB range, min
Internally-Generated Spurious	<-115 dBm equivalent input
LO Level at RF Input	-90 dBm, max
Demodulation Modes	AM, FM, CW & Pulse (ISB optional)
Video Outputs (Simultaneous)	AM, Pulse 0.5 V peak FM, 0.5 V peak into 93 ohms
Video Response	DC to 1/2 IFBW
Audio Outputs	10 mW, min into 600 ohms
AM/FM Audio Response	0.1 to 15 kHz
Variable BFO	±4 kHz in 40-Hz steps (±2 kHz in 20-Hz steps with SSB)
ISB (Option)	200 to 3200 Hz
COR/Squelch	Adjustable threshold to 80 dB above noise floor for selected IFBW
IFBWs	3 standard 2 additional as options (See Table 1)

**Note: An order must specify the three IFBWs selected as standard.

IF Shape Factor ..... See Table 1

Temperature Range ..... Operating 0 to 50°C
Non-Operating -20 to 80°C

Power Requirements ..... 115/230 Vac +15%, 47 to 63 Hz

Power Consumption ..... 45 W nominal

Weight & Dimensions

Height	Width	Depth	Weight
3.5 in (8.89 cm)	8.25 in (20.96 cm)	19 in (48.26 cm)	25 lbs (11.31 kg)

Specifications for the WJ-8615P/FEX16

Noise Figure ..... 9.5 dB, typ; 12.5 dB, max (500 to 1100 MHz)

3rd-order Intercept Point ..... 11.5 dB, typ; 14.5 dB, max (1100 to 1600 MHz)
0 dBm, typ; -5 dBm, min (500 to 1600 MHz)

Image Rejection ..... 70 dB, min (500 to 1600 MHz)

Final IF Rejection ..... 75 dB, min (500 to 1600 MHz)

Maximum RF Input Without Damage ..... +20 dBm

Table I. IF Shape Factors

Bandwidth (kHz)[1]	Max Shape Factor 60:3 dB BW	20 to 500 Mhz Sensitivity (dBm)[2]
3.2 [3]	3:1	-107
6.4	3:1	-107
10	3:1	-107
20	3:1	-104
50	3:1	-100
75	3:1	-98
100	3:1	-97
250	4:1	-93
300	4:1	-92
500	4:1	-90
1000	4:1	-87
2000	4:1	-84
4000	4:1	-81
8000	4:1	-78

[1] Consult factory for specific IFBW configurations.
[2] Sensitivity Conditions without preselection or frequency extender.
[3] With the 3.2-kHz bandwidth, the audio and video outputs will be 6 dB less than published specifications.
AM-- Input signal AM modulation 50% by a 1-kHz tone produces a minimum video output (S+N/N) in ratio of 10 dB.
FM-- Input signal FM modulated at a 1-kHz rate, with a peak deviation equal to 30% of the selected IFBW produces a minimum video output (S+N/N) ratio of 17 dB. (Note: A 400-Hz modulation rate is required for the 10-kHz and 6.4-kHz IFBWs, and 200-Hz modulation is required for the 3.2-kHz IFBW.)

Table 2. Connectors

I/O	Function	Type
Input	Antenna	N
	External Reference	BNC
	AC	3-pin IEC
Output	AM/FM video	BNC
	Phone	1/4" stereo
	Logging, handoff port	15-pin "D"
	SM or optional wideband 21.4-MHz IF	BNC
	Selected bandwidth 21.4-MHz IF	BNC
	FM monitor	BNC
Bidirectional	Remote control	IEEE-488
Other	COR	BNC

Table 3. Options

Nomenclature	Function	Physical Characteristics
WJ-8515/FEX11 Frequency Extender	• Extends tuning range from 500 up to 1100 MHz	• Completely enclosed subassemblies composed of: - UHF preselector - UHF preamplifer mixer - UHF LO Synthesizer - RF switch
WJ-8615P/FEX12 Frequency Extender	• Extends tuning range from 500 up to 1200 MHz	• Same as WJ-8615P/FEX11
WJ-8615P/FEX16 Frequency Extender	• Extends tuning range from 500 up to 1600 MHz	• Self-contained subassembly mounts inside the main receiver in the same space provided for the WJ-8615P/FEX11 • Factory can retrofit standard WJ-8615Ps
WJ-8615P/ISB Independent Sideband	• Detects upper, lower, or both sideband signals	• 2 independent audio outputs for: - upper sideband signal - lower sideband signal • Automatic selection of narrowest bandwidth (a 6.4-, 10- or 20-kHz IFBW is preferred for the 1st bandwidth)
WJ-8615P/HFE High Frequency Extension	• Enables tuning from 2 to 500 MHz	• 15-dB typical noise figure • Not required with WJ-8615P/PRE
WJ-8615P/PRE Tracking Preselector	• Provides bandpass filtering of the RF spectrum between 20 & 500 MHz • *Bypass* mode allows 2 to 500 MHz frequency coverage	• Nominal 10% 3-dB bandwidth • Preselector uses 4 separate, tunable filter bands, each covering a different segment of the overall range
WJ-8615P/SAO Selected Audio Output	• Provides a bus-controllable audio output from a receiver to a controller, or any device from which the receiver is remotely operated	
WJ-8615P/WBO Wideband Output	• Provides a leveled wideband 21.4-MHz IF output signal with a constant bandwidth of at least 4.0 MHz	• Maintains output level: -30 dBm • Gain control through an internal AGC circuit maintains output at ±6 dB of rated level with input level changes from -75 to -5 dBm